CR-91 Event – Shelby County, AL Preliminary Air Monitoring Summary September 17, 2016 05:00

Prepared by

Center for Toxicology and Environmental Health, L.L.C. (CTEH®)

On Behalf of Colonial Pipeline





Introduction

On September 9, 2016, the Center for Toxicology and Environmental Health, L.L.C. (CTEH®) initiated air monitoring in support of response efforts to the gasoline release in Shelby County, AL. This report presents the real-time air monitoring data recorded from September 16 2016 17:00 to September 17, 2016 05:00 CDT.

Real-Time Air Monitoring¹

Real-time air monitoring was conducted to evaluate the potential airborne presence of gasoline-associated constituents, if any, during response operations. All instrumentation was calibrated at least once per day or per manufacturer's recommendations. Target analytes were measured as total volatile organic compounds (VOCs), oxygen, benzene, and flammability as the percent of the lower explosive limit (LEL) using remote telemetering RAESystems* AreaRAEs, hand-held instruments such as RAESystems* MultiRAE Pro/Plus' and UltraRAEs, as well as Gastec* colorimetric detection tubes.

During this monitoring period, four benzene and six VOC action level exceedances were recorded during worker activity monitoring, including instantaneous VOC and benzene readings which were recorded above the action level. When necessary, workers egressed the area in accordance with the approved sampling and analysis plan.

Table 1, below, presents the results of real-time air monitoring using hand-held instruments. Maps of the incident site location and locations of hand-held real-time air monitoring readings are provided in **Appendix I**.

Real-time air monitoring refers to the use of hand-held instruments that provide near-instantaneous readings of an airborne chemical concentration without the need for laboratory analysis.



Table 1: Hand-Held Real-Time Air Monitoring Summary¹ September 16, 2016 17:00 to September 17, 2016 05:00

Location Category	Analyte	Instrument	Count of Readings	Count of Detections	Range of Detections ^{2,3}
	Benzene	UltraRAE	35	5	0.5 - 1.9 ppm
	0/151	MultiRAE Plus	58	0	<1 %
	%LEL	MultiRAE Pro	46	0	<1 %
Worker Activity Monitoring		MultiRAE Plus	3	2	20.9 - 20.9 %
Wiering III.B	O ₂	MultiRAE Pro	2	2	20.9 - 20.9 %
	1100	MultiRAE Plus	57	2	1.7 - 1.7 ppm
	VOCs	MultiRAE Pro	57	16	0.2 - 159 ppm
Site Characterization	Benzene	UltraRAE	4	1	11.05 - 11.05 ppm
	LEL	MultiRAE Pro	8	5	4 - 25 %
	VOC	MultiRAE Pro	8	8	1 - 512 ppm

Please Note: The data displayed in the above table has not undergone complete QC analysis and is presented in a preliminary format.

During this monitoring period remote telemetering equipment recorded 5445 detections of VOCs above the CTEH established action level of 30 ppm and 45 detections of LEL above the CTEH established action level of 10% (3% as raw values on LEL sensors).

Table 2 (below) summarizes remote telemetering AreaRAE data for this monitoring period. For this reporting period AreaRAE monitoring data may contain drift events². **Appendix I** and **Appendix II** include location maps and graphs for remote telemetering data, respectively. ⁴

²⁻Maximum detections preceded by the "\" symbol are considered non-detections below the instrument limit of detection (LoD) value to the right.

³Numbers are the raw values, no correction factors have been applied.

² Drift is defined as any interference in the PID's or electrochemical sensor's ability to accurately report the concentration of a chemical in the atmosphere. Humidity, rapid temperature changes, and compromised batteries are examples of common sources of drift.

Table 2: Remote Telemetering Real-time Air Monitoring Summary^{1,3} September 16, 2016 17:00 to September 16, 2016 05:00

Unit	Location Description	Analyte	Count of Readings	Count of Detections	Range of Detections
		LEL	2624	62	1.1 - 8.9 %
ARO1	2A Compressors	O ₂	2624	2624	20.9 - 21.3 %
		VOC	2624	2427	0.1 - 1408.5 ppm
	VVVV	LEL	26	0	<1 %
ARO3	West of Release	O ₂	26	26	20.9 - 21.5 %
	Site/Near Stopple 1	VOC	26	16	0.2 - 38.5 ppm
		LEL	2453	0	<1 %
ARO4	2A Frac Tank Staging	O ₂	2453	2453	20.9 - 20.9 %
		VOC	2453	1904	0.1 - 63.7 ppm
		LEL	630	0	<1 %
ARO5	2A Recovery	O ₂	630	630	20.9 - 21.5 %
	590 BATSANS CO. 10	VOC	630	386	0.1 - 117.5 ppm
	2000	LEL	1993	164	1.2 - 4.2 %
ARO6	East of Release	O ₂	1993	1993	20.9 - 22.2 %
	Site/Near Stopple 2	VOC	1993	1642	0.1 - 100.4 ppm
		LEL	2583	0	<1 %
ARO7	2B Recovery	O ₂	2583	2583	20.9 - 21.1 %
10 (10 (10 (10 (10 (10 (10 (10 (10 (10 (VOC	2583	1012	0.1 - 142.6 ppm	
		LEL	2651	44	1.2 - 22.3 %
ARO8	Main Staging Area Frac	O ₂	2651	2651	20.9 - 21.3 %
	Tanks	VOC	2651	288	0.1 - 947.5 ppm
		LEL	1499	2	1.5 - 3.9 %
ARO9	Release Site	O ₂	1499	1499	20.5 - 20.9 %
		VOC	1499	1292	0.1 - 131.6 ppm
	On path between	LEL	2603	0	<1 %
AR10	Recovery 2A and	O ₂	2603	2603	20.9 - 20.9 %
	Recovery 2B.	VOC	2603	2572	0.1 - 343.2 ppm
		LEL	1976	0	<1 %
AR11	Main Staging Entrance	O ₂	1976	1976	20.9 - 21.2 %
	East of TRG checkpoint	VOC	1976	0	<0.1 ppm
	TRG Checkpoint 2 -	LEL	1214	0	<1 %
AR13	access to stopple 1,	O ₂	1214	1214	20.9 - 21.5 %
VIIT?	Recovery 2A and 2A	VOC	1214	1	1.3 - 1.3 ppm
	Frac Tank Staging Area.	LEL	1443	0	<1 %
AR14	Cab of excavator at	O ₂	1443	1443	20.5 - 20.9 %
<u>.</u> T	release site	VOC	1443	1443	1.7 - 149.4 ppm

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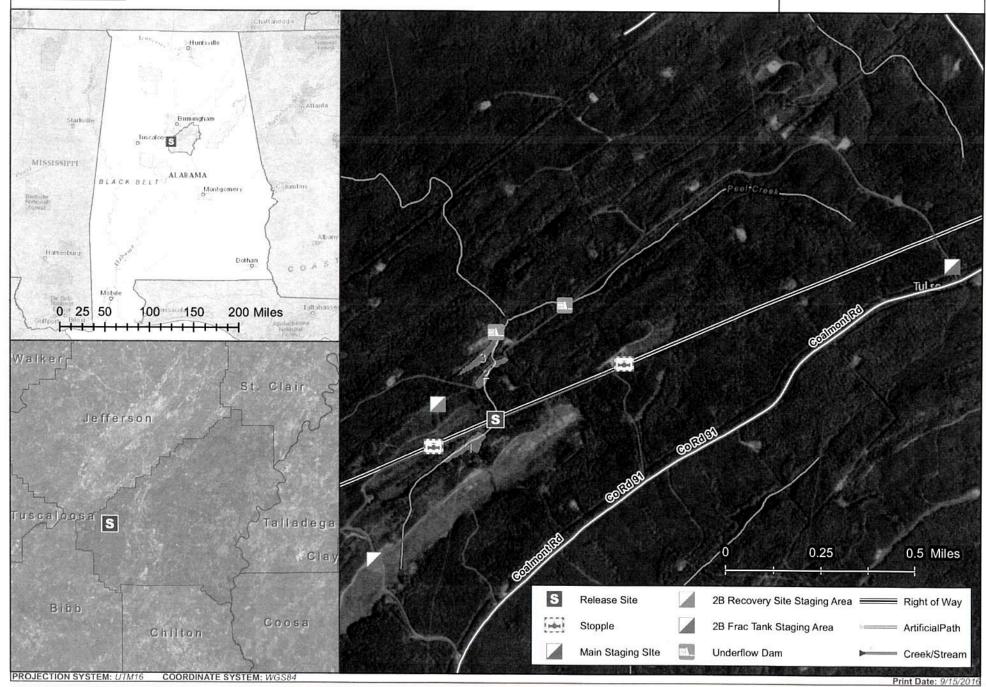
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Appendix I:

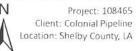
Site Location, Hand-Held Real-Time
Air Monitoring Location, and
Remote Telemetering Air Monitoring
Location Maps

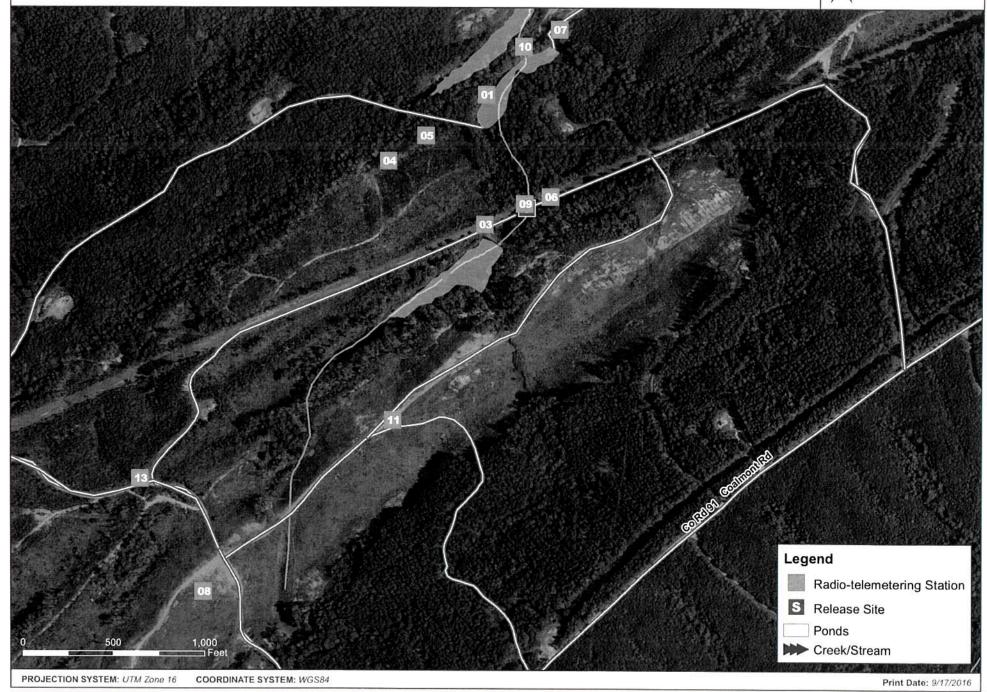
Project: 108465 Client: Colonial Pipeline Location: Shelby County, AL





Radio-telemetering Real-time Air Monitoring Station Locations CR-91 Event 9/17/2016







Manually-Logged Real-Time Reading Locations CR-91 Event | 09/16/2016 17:00 – 09/17/2016 05:00

Project: 108465 Client: Colonial Pipeline Location: Shelby County, AL

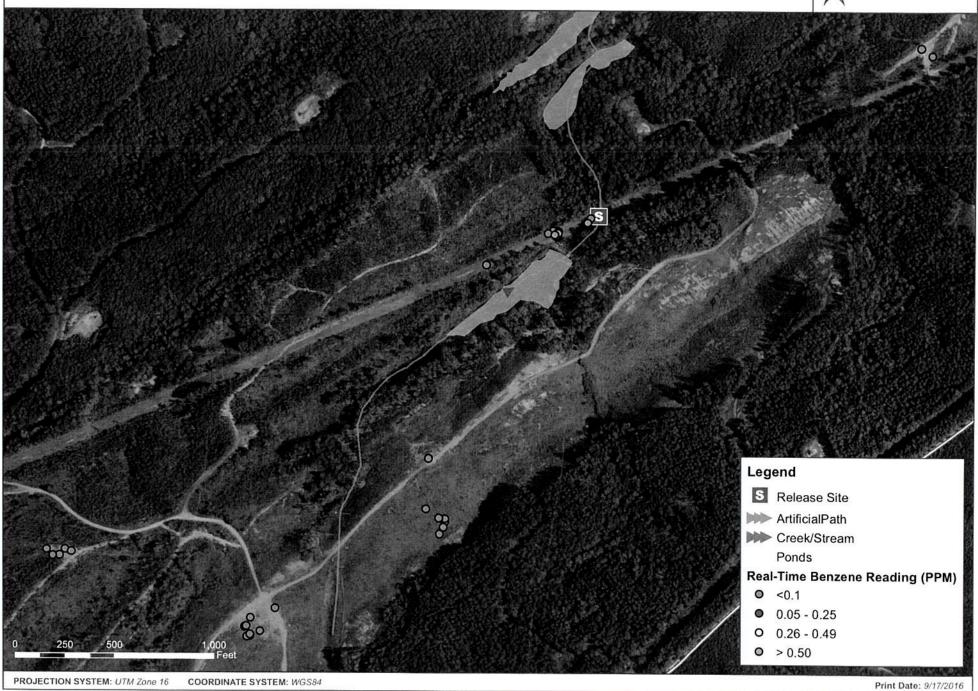
Legend S Release Site Real-Time Reading Location MartificialPath Creek/Stream Ponds PROJECTION SYSTEM: UTM Zone 16 COORDINATE SYSTEM: WGS84 Print Date: 9/17/2016



Manually-Logged Real-Time Readings | Benzene

CR-91 Event | 09/16/2016 17:00 - 09/17/2016 05:00





Manually-Logged Real-Time Readings | LEL

CR-91 Event | 09/16/2016 17:00 - 09/17/2016 05:00



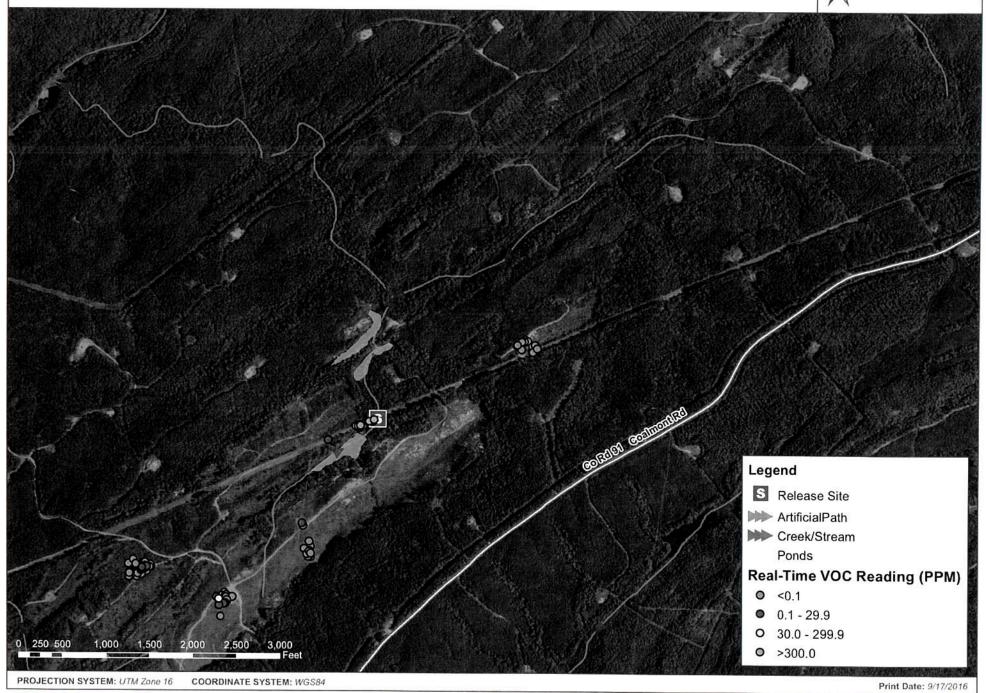




Manually-Logged Real-Time Readings | VOC

CR-91 Event | 09/16/2016 17:00 - 09/17/2016 05:00







Appendix II:

Remote Telemetering Air Monitoring Graphs

Remote Telemetering Real-time Air Monitoring | LEL (R-91 Event | 9/16/2016 17 00 to 9/17/2016 04/59)

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Remote Telemetering Real-time Air Monitoring | Oxygen CR-91 Event | 9/16/2016 12 to to 5/17/2016 104 59 Unit/Location

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Remote Telemetering Real-time Air Monitoring | VOC CR-31 Event | 9/34/2016 17 00 to 9/37/2016 04:59

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Table 1: Hand-Held Real-Time Air Monitoring Summary¹ September 17, 2016 05:00 to September 17, 2016 17:00

Location Category	Analyte	Instrument	Count of Readings	Count of Detections	Range of Detections ^{2,3}
	Benzene	UltraRAE	35	5	0.5 - 1.9 ppm
	%LEL	MultiRAE Plus	58	0	<1 %
	70LLL	MultiRAE Pro	46	0	<1 %
Worker Activity Monitoring	0-	MultiRAE Plus	3	2	20.9 - 20.9 %
	O ₂	MultiRAE Pro	2	2	20.9 - 20.9 %
	VOCs	MultiRAE Plus	57	2	1.7 - 1.7 ppm
	VOCS	MultiRAE Pro	57	16	0.2 - 159 ppm
	Benzene	UltraRAE	4	1	11.05 - 11.05 ppm
Site Characterization	LEL	MultiRAE Pro	8	5	4 - 25 %
	VOC	MultiRAE Pro	8	. 8	1 - 512 ppm

Please Note: The data displayed in the above table has not undergone complete QC analysis and is presented in a preliminary format.

During this monitoring period remote telemetering equipment recorded 5445 detections of VOCs above the CTEH established action level of 30 ppm and 45 detections of LEL above the CTEH established action level of 10% (3% as raw values on LEL sensors).

Table 2 (below) summarizes remote telemetering AreaRAE data for this monitoring period. For this reporting period AreaRAE monitoring data may contain drift events². Appendix I and Appendix II include location maps and graphs for remote telemetering data, respectively. ⁴

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Table 2: Remote Telemetering Real-time Air Monitoring Summary^{1,3} September 17, 2016 05:00 to September 17, 2016 17:00

Unit	Location Description	Analyte	Count of Readings	Count of Detections	Range of Detections
		LEL	2372	0	<1 %
ARO1	2A Compressors	O ₂	2372	2372	20.9 - 20.9 %
		VOC	2372	2012	0.1 - 300.2 ppm
		LEL	2489	0	<1 %
ARO3	West of Release Site/Near Stopple 1	O ₂	2489	2453	20.9 - 20.9 %
	Site/Near Stoppie 1	VOC	2489	1608	0.1 - 4.6 ppm
		LEL	2476	0	<1 %
ARO4	2A Frac Tank Staging	O ₂	2476	2476	20.9 - 20.9 %
		VOC	2476	909	0.1 - 6.8 ppm
		LEL	2527	3	1.3 - 3.1 %
AR05	2A Recovery	O ₂	2527	2527	20.9 - 21.4 %
		VOC	2527	1687	0.1 - 98.8 ppm
	77 EXTENSION 1	LEL	2319	0	<1 %
ARO6	East of Release	O ₂	2319	2319	20.9 - 20.9 %
	Site/Near Stopple 2	VOC	2319	616	0.1 - 63.6 ppm
		LEL	2485	0	<1 %
ARO7	2B Recovery	O ₂	2485	2485	20.9 - 21.2 %
		VOC	2485	1317	0.1 - 12.2 ppm
		LEL	2503	0	<1 %
ARO8	Main Staging Area Frac	O ₂	2503	2503	20.4 - 20.9 %
	Tanks	VOC	2503	2500	0.1 - 109.5 ppm
		LEL	2514	0	<1 %
ARO9	Release Site	O ₂	2514	2514	20.9 - 20.9 %
		VOC	2514	525	0.1 - 71.1 ppm
	On path between	LEL	2177	0	<1 %
AR10	Recovery 2A and	O ₂	2177	2101	20.9 - 21.3 %
	Recovery 2B.	VOC	2177	0	<0.1 ppm
	Meshapole Andrew Scholier Andrew St. 1911 But	LEL	2090	0	<1 %
AR11	Main Staging Entrance	O ₂	54	54	20.9 - 20.9 %
	East of TRG checkpoint	VOC	2090	107	0.1 - 0.4 ppm
	TRG Checkpoint 2 -	LEL	2006	0	<1 %
AR13	access to stopple 1,	O ₂	2006	2006	20.9 - 20.9 %
and the	Recovery 2A and 2A	VOC	2006	2005	0.1 - 1.5 ppm
	Frac Tank Staging Area.	LEL	2534	0	<1 %
AR14	Cab of excavator at	O ₂	2534	2534	20.9 - 20.9 %
	release site	VOC	2534	2534	0.6 - 59 ppm

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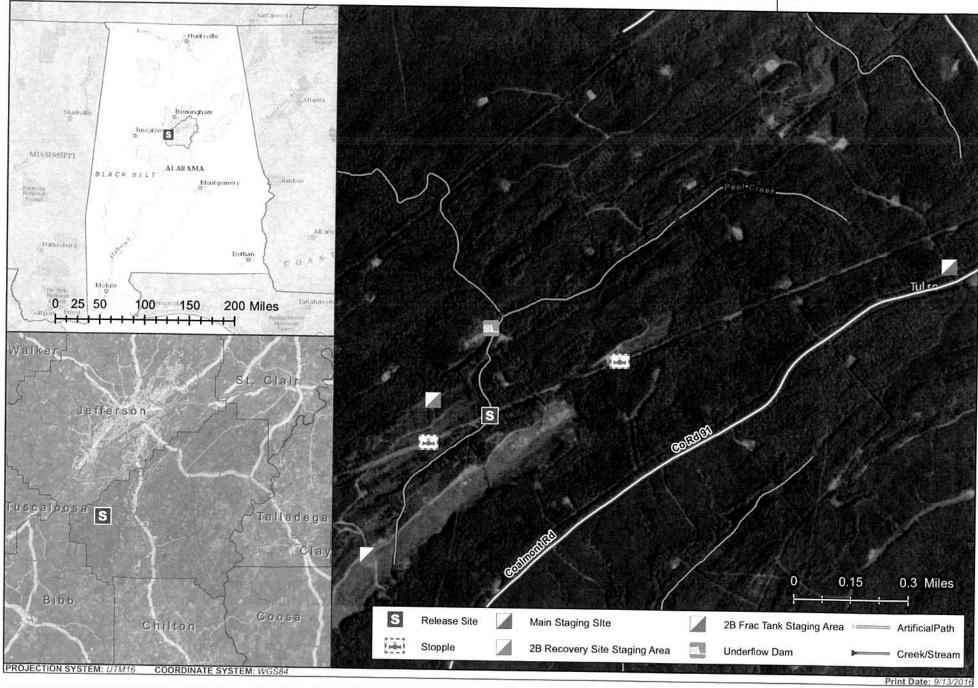
Appendix I:

Site Location, Hand-Held Real-Time
Air Monitoring Location, and
Remote Telemetering Air Monitoring
Location Maps





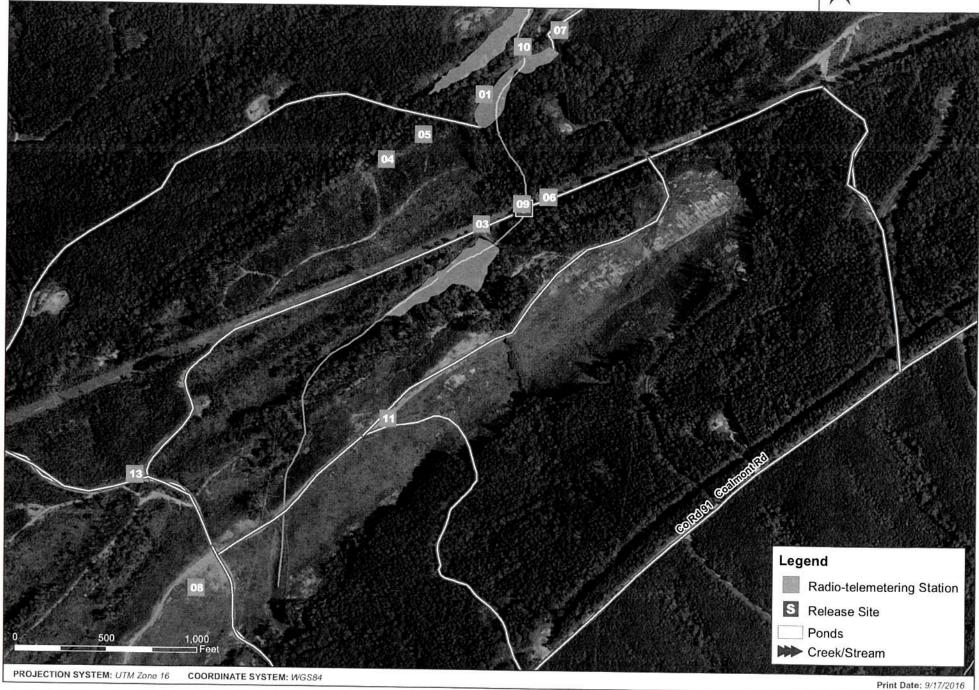
Project: 108465 Client: Colonial Pipeline Location: Shelby County, AL



CTEH

Radio-telemetering Real-time Air Monitoring Station Locations CR-91 Event 9/17/2016







Manually-Logged Real-Time Reading Locations

CR-91 Event | 09/17/2016 05:00 - 09/17/2016 17:00



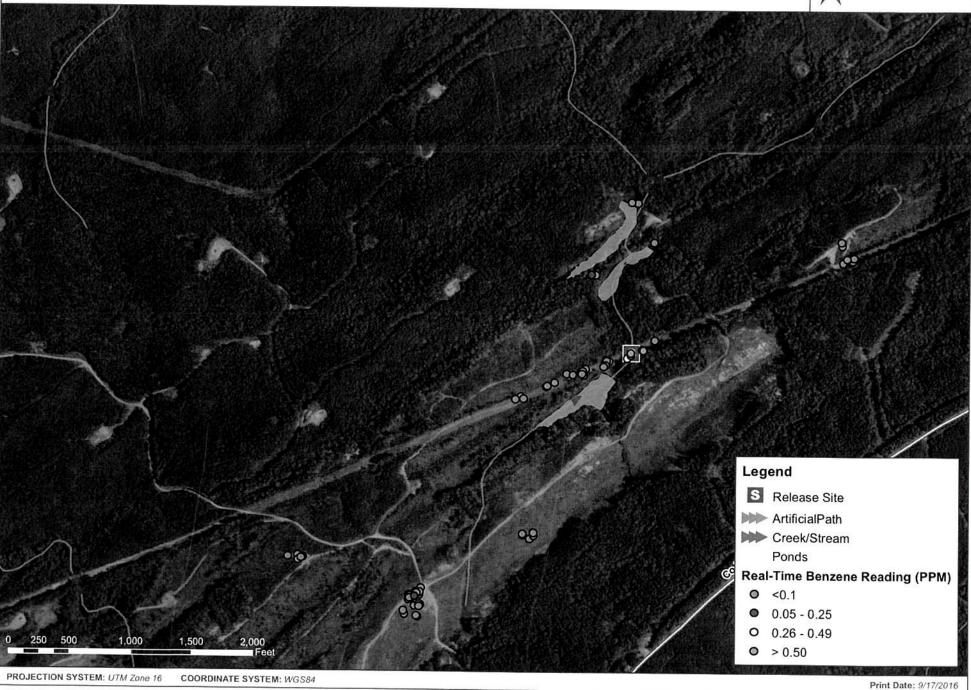




Manually-Logged Real-Time Readings | Benzene

CR-91 Event | 09/17/2016 05:00 - 09/17/2016 17:00





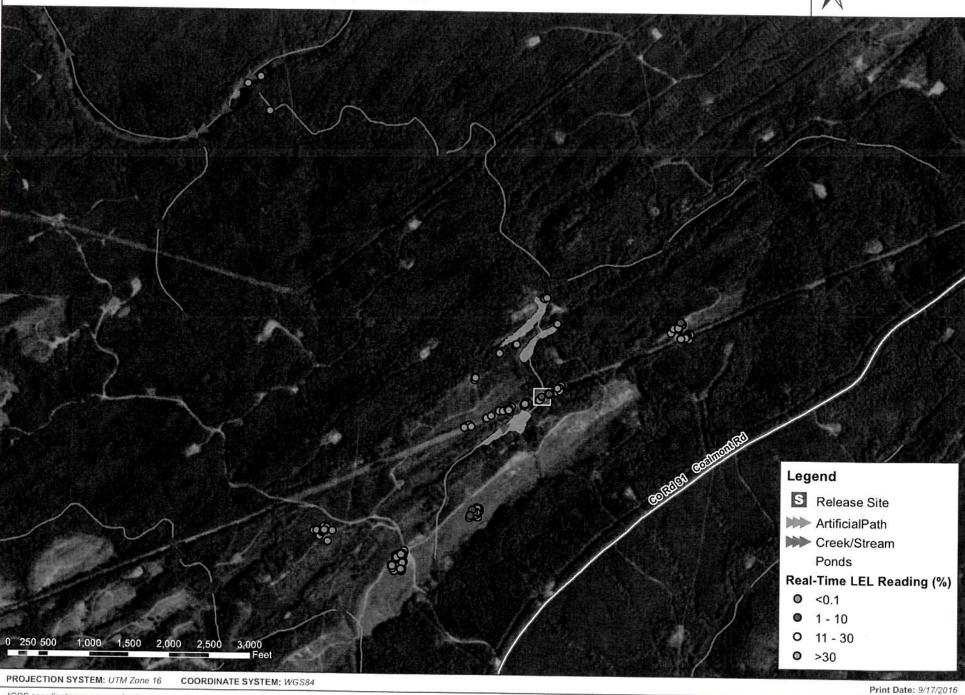


Manually-Logged Real-Time Readings | LEL

CR-91 Event | 09/17/2016 05:00 - 09/17/2016 17:00



Project: 108465 Client: Colonial Pipeline Location: Shelby County, AL

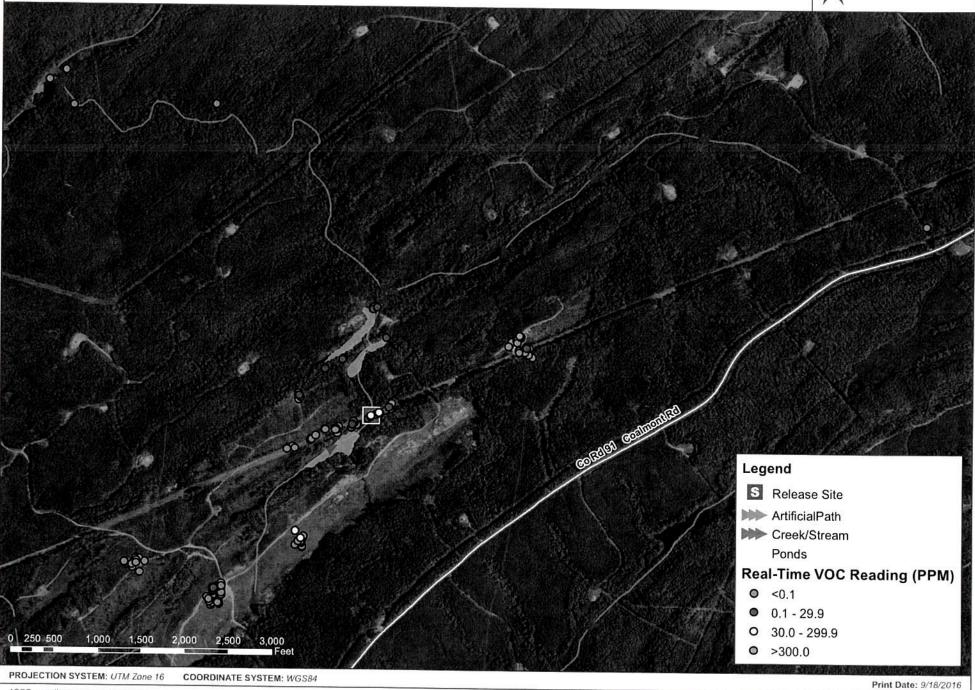




Manually-Logged Real-Time Readings | VOC

CR-91 Event | 09/17/2016 05:00 - 09/17/2016 17:00







Appendix II:

Remote Telemetering Air Monitoring Graphs

Remote Telemetering Real-time Air Monitoring | VOC (23-9) Event | 9/17/2016 05:00 to 9/17/2016 16:59

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Remote Telemetering Real-time Air Monitoring | LEL CR-91 Event | 9/17/2016 05:00 to 9/17/2016 16:59

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AR09 / Release Site	%	2			-			
AR10 / On path between Recovery 2A and Recovery 2B	%	5 4 2			ž.		-	
AR11 / Main Staging Entrance East of TRG checkpoint	8	5 4 2						
AR13/TRG Checkpoint 2	*	6 4 2						
AR14/Cab of excavator at release site	*	6 4 2					(management)	·
		9/17/2016 05:00	9/17/2016 07 00	9/17/2016 09:00	9/17/2016 11:00 Date/Time	9/17/2016 13:00	9/17/2016 15:0	0 9/17/2016 17 00

LFL readings are a true representation of atmospheric conditions (appropriate correction factors have been applied to field values).

Remote Telemetering Real-time Air Monitoring | Oxygen CR-91 Event | 9/17/201605:00 to 9/17/201616.59

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CR-91 Event – Shelby County, AL Preliminary Air Monitoring Summary September 18, 2016 05:00

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	Benzene	Gastec #121L	1	0	<0.05 ppm
	benzene	UltraRAE	73	10	0.05 - 0.3 ppm
	%LEL	MultiRAE Plus	55	0	<1 %
Worker Activity Monitoring		MultiRAE Pro	149	3	3 - 6 %
Ü	O ₂	MultiRAE Pro	2	2	20.9 - 20.9 %
	VOCs	MultiRAE Plus	47	5	0.1 - 9 ppm
	VOCS	MultiRAE Pro	159	57	0.1 - 638 ppm
Sito Characterization	%LEL	MultiRAE Pro	3	2	4 - 8 %
Site Characterization	VOC	MultiRAE Pro	3	3	125 - 352.8 ppm

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During this monitoring period remote telemetering equipment recorded 7851 detections of VOCs above the CTEH established action level of 30 ppm and 11 detections of LEL above the CTEH established action level of 10% (3% as raw values on LEL sensors).

Table 2 (below) summarizes remote telemetering AreaRAE data for this monitoring period. For this reporting period AreaRAE monitoring data may contain drift events². **Appendix I** and **Appendix II** include location maps and graphs for remote telemetering data, respectively. ⁴

²Maximum detections preceded by the "<" symbol are considered non-detections below the instrument limit of detection (LoD) value to the right.

³Numbers are the raw values, no correction factors have been applied.

² Drift is defined as any interference in the PID's or electrochemical sensor's ability to accurately report the concentration of a chemical in the atmosphere. Humidity, rapid temperature changes, and compromised batteries are examples of common sources of drift.



Table 2: Remote Telemetering Real-time Air Monitoring Summary^{1,3} September 17, 2016 17:00 to September 18, 2016 05:00

Unit	Location Description	Analyte	Count of Readings	Count of Detections	Range of Detections ²
AR01	2A Compressors	LEL	8382	38	1.1 - 4.9 %
		O ₂	8382	8382	20.9 - 20.9 %
		VOC	8382	6867	0.1 - 276.5 ppm
ARO4	2A Frac Tank Staging	LEL	7315	0	<1 %
		O ₂	7315	7315	20.9 - 20.9 %
		VOC	7315	7315	0.2 - 105.4 ppm
AR05	2A Recovery	LEL	8464	0	<1 %
		O ₂	8464	8464	20.9 - 20.9 %
		VOC	8464	1908	0.1 - 24.5 ppm
AR06	East of Release Site/Near Stopple 2	LEL	7397	0	<1 %
		O ₂	7397	7397	20.9 - 21.4 %
		VOC	7397	4208	0.1 - 123.7 ppm
AR07	2B Recovery	LEL	8368	0	<1 %
		O ₂	8368	8368	20.9 - 20.9 %
		VOC	8368	3779	0.1 - 14.8 ppm
AR08	Main Staging Area Frac Tanks	LEL	7242	0	<1 %
		O ₂	7242	7242	20.9 - 20.9 %
		VOC	7242	7242	0.5 - 736.4 ppm
ARO9	Release Site	LEL	8382	0	<1 %
		O ₂	8382	8382	20.9 - 20.9 %
		VOC	8382	8382	4.8 - 166.7 ppm
AR10	On path between Recovery 2A and Recovery 2B.	LEL	8380	0	<1 %
		O ₂	8380	8380	20.9 - 20.9 %
		VOC	8380	5279	0.1 - 123.5 ppm
AR11	Main Staging Entrance East of TRG checkpoint	LEL	8398	0	<1 %
		O ₂	8398	8398	20.9 - 20.9 %
		VOC	8398	0	<0.1 ppm
AS12	Boom Site #2	LEL	2380	0	<1 %
		VOC	2380	1	0.3 ppm
AR13	TRG Checkpoint 2 - access to stopple 1, Recovery 2A and 2A Frac Tank Staging Area.	LEL	8390	0	<1 %
		O ₂	8390	8390	20.9 - 20.9 %
		VOC	8390	8390	0.3 - 2.1 ppm
AR14	Cab of excavator at release site	LEL	7815	0	<1 %
		O ₂	7815	7815	20.9 - 20.9 %
		VOC	7815	7815	0.7 - 30.1 ppm
1D/agra no	to The data distant land to the	1 0 1	7013	/013	0.7 - 30.1 ppm

¹Please note: The data displayed here has not undergone complete QA/QC analysis and is presented in a preliminary format.

²Maximum detections preceded by the "<" symbol are considered at the limit of detection (LoD) value to the right.

³LEL and VOC values are raw values, correction factors have not been applied.



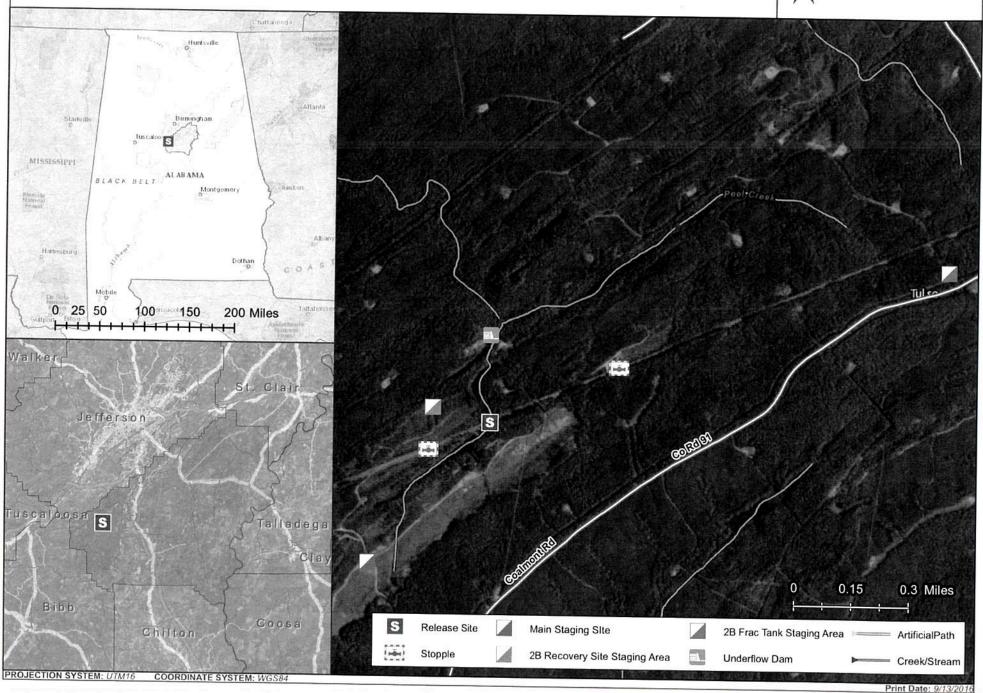
Appendix I:

Site Location, Hand-Held Real-Time
Air Monitoring Location, and
Remote Telemetering Air Monitoring
Location Maps





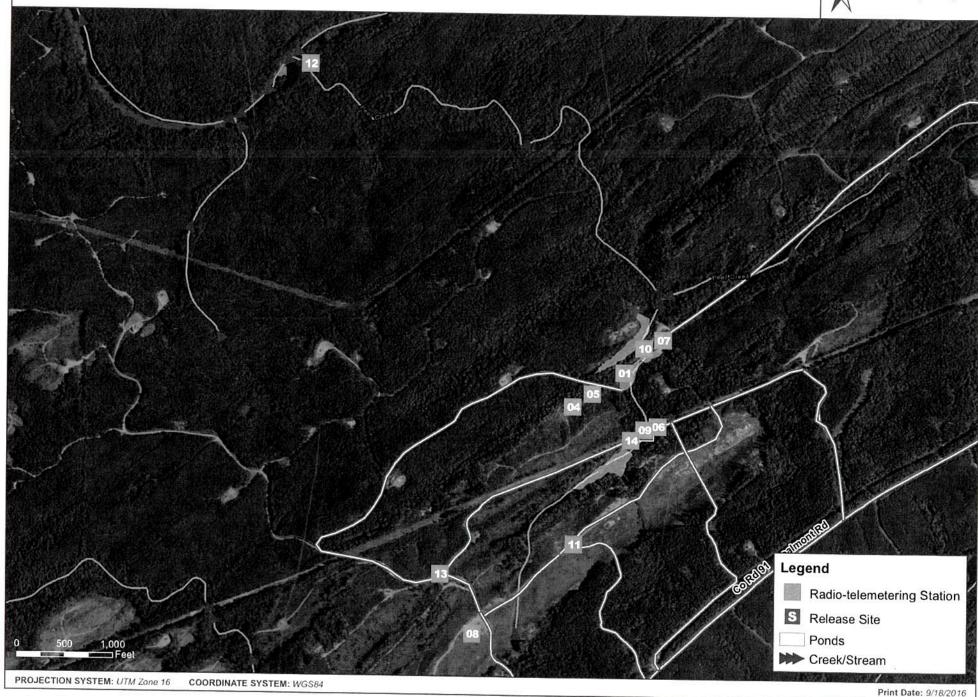
Project: 108465 Client: Colonial Pipeline Location: Shelby County, AL



CTEH

Radio-telemetering Real-time Air Monitoring Station Locations CR-91 Event 9/18/2016

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, LA



Manually-Logged Real-Time Reading Locations CR-91 Event | 09/17/2016 17:00 – 09/17/2016 05:00

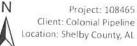


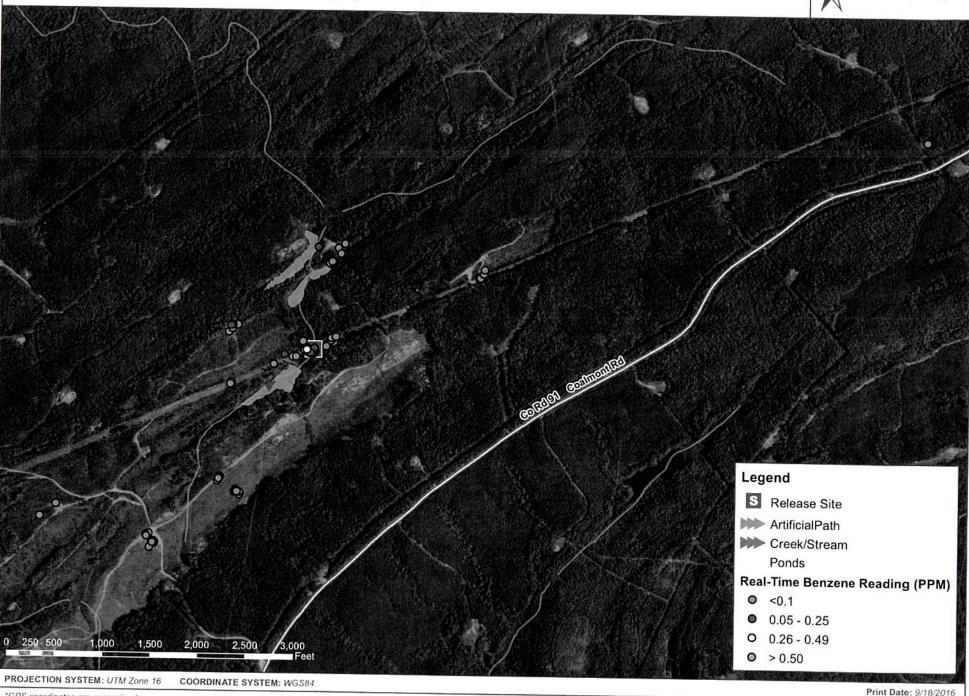


CTEH

Manually-Logged Real-Time Readings | Benzene

CR-91 Event | 09/17/2016 17:00 - 09/17/2016 05:00

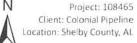




CTEH

Manually-Logged Real-Time Readings | LEL

CR-91 Event | 09/17/2016 17:00 – 09/17/2016 05:00

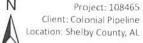


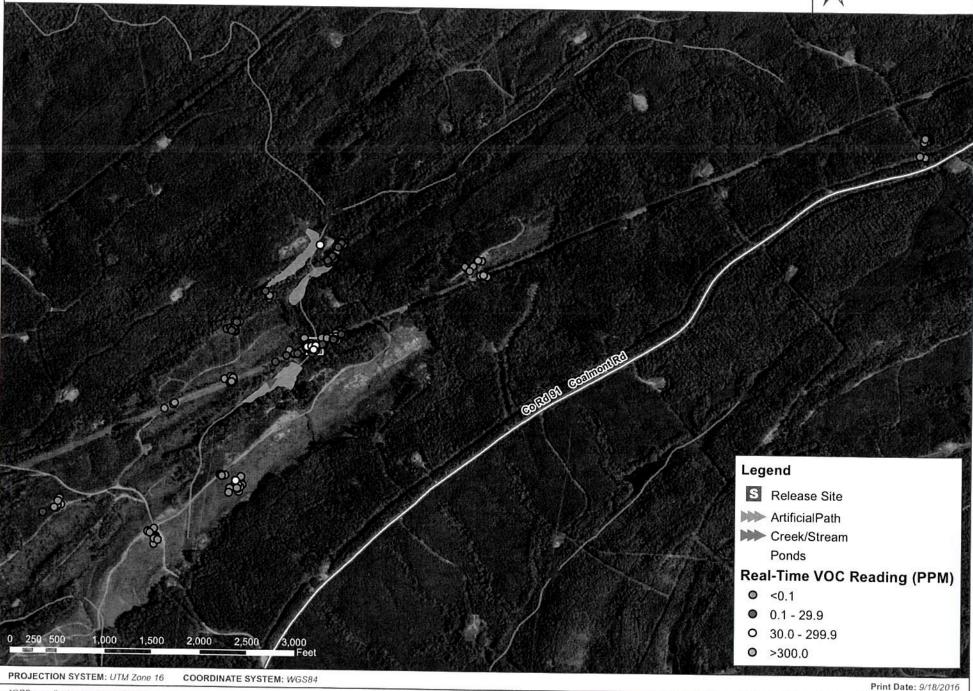




Manually-Logged Real-Time Readings | VOC

CR-91 Event | 09/17/2016 17:00 - 09/17/2016 05:00







Appendix II:

Remote Telemetering Air Monitoring Graphs

Remote Telemetering Real-time Air Monitoring | LEL CR-91 Event | 9/17/2016 17/01 to 9/18/2016 04/59

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Remote Telemetering Real-time Air Monitoring | VOC 08-31 Event | 9/12/2016 17/2016 | Sept. | S

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Date/Time

Remote Telemetering Real-time Air Monitoring | Oxygen CR-91 Fvent | 9/17/2016 12/81 to 9/18/2016 0±:59

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AR06/East of Release Site/Tear & Stopple Z	70	
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ARD:7/ Recovery 28	10	
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AR08/IJAnn Staging Area Frac Tams 6	10	
	0 20	
AR09 / Release Site	10	
	0 02	
ARIG/On path between Recovery 24 and Recovery 28		
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AR11/Nam Staging Entrance East of # TRG checkpoint	10	
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AR13/TRG Checkpoint 2	97	
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AR14/Cab of excavator at release	10	
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CR-91 Event – Shelby County, AL Preliminary Air Monitoring Summary September 18, 2016 17:00

Prepared by

Center for Toxicology and Environmental Health, L.L.C. (CTEH®)

On Behalf of Colonial Pipeline





Introduction

On September 9, 2016, the Center for Toxicology and Environmental Health, L.L.C. (CTEH®) initiated air monitoring in support of response efforts to the gasoline release in Shelby County, AL. This report presents the real-time air monitoring data recorded from September 18 2016 05:00 to September 18, 2016 17:00 CDT.

Real-Time Air Monitoring¹

Real-time air monitoring was conducted to evaluate the potential airborne presence of gasoline-associated constituents, if any, during response operations. All instrumentation was calibrated at least once per day or per manufacturer's recommendations. Target analytes were measured as total volatile organic compounds (VOCs), oxygen, benzene, and flammability as the percent of the lower explosive limit (LEL) using remote telemetering RAESystems* AreaRAEs, hand-held instruments such as RAESystems* MultiRAE Pro/Plus' and UltraRAEs, as well as Gastec* colorimetric detection tubes.

During this monitoring period, eight benzene, five LEL and nine VOC action level exceedances were recorded during worker activity monitoring, including instantaneous VOC and benzene readings which were recorded above the action level. When necessary, workers egressed the area in accordance with the approved sampling and analysis plan.

Table 1, below, presents the results of real-time air monitoring using hand-held instruments. Maps of the incident site location and locations of hand-held real-time air monitoring readings are provided in **Appendix I**.

¹ Real-time air monitoring refers to the use of hand-held instruments that provide near-instantaneous readings of an airborne chemical concentration without the need for laboratory analysis.



Table 1: Hand-Held Real-Time Air Monitoring Summary¹ September 18, 2016 05:00 to September 18, 2016 17:00

Location Category	Analyte	Instrument	Count of Readings	Count of Detections	Range of Detections ^{2,3}
	Benzene	UltraRAE	108	18	0.05 - 300 ppm
	Gasoline	Gastec #101L	3	0	<5 ppm
	Hexane	Gastec #102L	3	0	<1 ppm
	%LEL	MultiRAE Plus	33	0	<1 %
Worker Activity		MultiRAE Pro	183	5	4 - 20 %
Monitoring	Toluene	Gastec #122	2	0	<1 ppm
		Gastec #122L	2	0	<0.5 ppm
	VOCs	MultiRAE Plus	37	13	0.1 - 17.1 ppm
		MultiRAE Pro	183	51	0.1 - 1900 ppm
	Xylene	Gastec #123	- 2	0	<1 ppm
Community	LEL	MultiRAE Pro	2	0	<1 %
community	VOC	MultiRAE Pro	2	0	<0.1 ppm
	Benzene	UltraRAE	5	2	5 - 100 ppm
Site Characterization	%LEL	MultiRAE Pro	5	2	11 - 56 %
IDI NI TI	VOC	MultiRAE Pro	6	5	6.5 - 1250 ppm

Please Note: The data displayed in the above table has not undergone complete QC analysis and is presented in a preliminary format.

During this monitoring period remote telemetering equipment recorded 5060 detections of VOCs above the CTEH established action level of 30 ppm and 14 detections of LEL above the CTEH established action level of 10% (3% as raw values on LEL sensors).

Table 2 (below) summarizes remote telemetering AreaRAE data for this monitoring period. For this reporting period AreaRAE monitoring data may contain drift events². **Appendix I** and **Appendix II** include location maps and graphs for remote telemetering data, respectively. ⁴

²Maximum detections preceded by the "<" symbol are considered non-detections below the instrument limit of detection (LoD) value to the right.

³Numbers are the raw values, no correction factors have been applied.

² Drift is defined as any interference in the PID's or electrochemical sensor's ability to accurately report the concentration of a chemical in the atmosphere. Humidity, rapid temperature changes, and compromised batteries are examples of common sources of drift.



Table 2: Remote Telemetering Real-time Air Monitoring Summary^{1,3} September 18, 2016 05:00 to September 18, 2016 17:00

Unit	Location Description	Analyte	Count of Readings	Count of Detections	Range of Detections ²
		LEL	5258	95	1.2 - 5 %
AR01	2A Compressors	O ₂	5258	5258	20.9 - 21.6 %
		VOC	5258	4691	0.1 - 423.8 ppm
		LEL	8133	0	<1 %
ARO4	2A Frac Tank Staging	O ₂	8133	8133	20.9 - 20.9 %
		VOC	8133	5171	0.1 - 57.6 ppm
		LEL	6301	0	<1 %
AR05	2A Recovery	O ₂	6301	6301	20.9 - 20.9 %
		VOC	6301	2491	0.1 - 45.1 ppm
	Foot of Deleve	LEL	8290	0	<1 %
AR06	East of Release Site/Near Stopple 2	O ₂	8290	8290	20.9 - 21.9 %
	orte, redi otoppie z	VOC	8290	2655	0.1 - 46 ppm
		LEL	8070	0	<1 %
AR07	2B Recovery	O ₂	8070	8070	20.9 - 20.9 %
	W.	VOC	8070	4976	0.1 - 78.6 ppm
		LEL	8119	0	<1 %
ARO8	Main Staging Area Frac Tanks	O ₂	8119	8119	20.5 - 21.3 %
	Taliks	VOC	8119	5755	0.1 - 35.6 ppm
		LEL	8354	0	<1 %
AR09	Release Site	O ₂	8354	8354	20.7 - 20.9 %
		VOC	8354	4560	0.1 - 118.1 ppm
	On path between	LEL	8133	0	<1 %
AR10	Recovery 2A and	O ₂	8133	8133	20.4 - 20.9 %
	Recovery 2B.	VOC	8133	6428	0.1 - 157.2 ppm
	N. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	LEL	6485	0	<1 %
AR11	Main Staging Entrance East of TRG checkpoint	O ₂	6485	6485	20.9 - 20.9 %
	cast of Tho checkpoint	VOC	6485	0	<0.1 ppm
AR12	Dann Sita #2	LEL	2740	0	<1 %
ANIZ	Boom Site #2	VOC	2740	27	0.1 - 0.1 ppm
	TRG Checkpoint 2 -	LEL	8100	0	<1 %
AR13	access to stopple 1,	O ₂	8100	8100	20.9 - 21.3 %
	Recovery 2A and 2A Frac Tank Staging Area.	VOC	8100	4109	0.1 - 0.9 ppm
	, rac rank Staging Area.	LEL	4054	0	<1 %
AR14	Cab of excavator at	O ₂	4054	4054	20.9 - 20.9 %
	release site	VOC	4054	5-19020	
1 D/	. 77. 1 . 1 . 1	100	4034	99	0.1 - 5.6 ppm

Please note: The data displayed here has not undergone complete QA/QC analysis and is presented in a preliminary format.

²Maximum detections preceded by the "<" symbol are considered at the limit of detection (LoD) value to the right.

³LEL and VOC values are raw values, correction factors have not been applied.

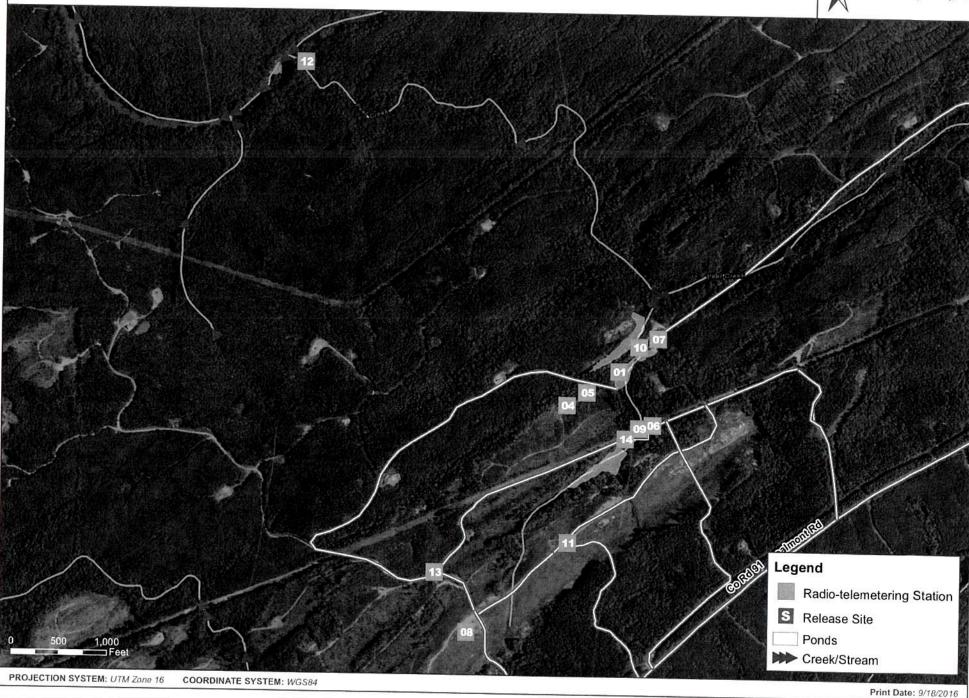


Appendix I:

Site Location, Hand-Held Real-Time
Air Monitoring Location, and
Remote Telemetering Air Monitoring
Location Maps

Radio-telemetering Real-time Air Monitoring Station Locations CR-91 Event 9/18/2016

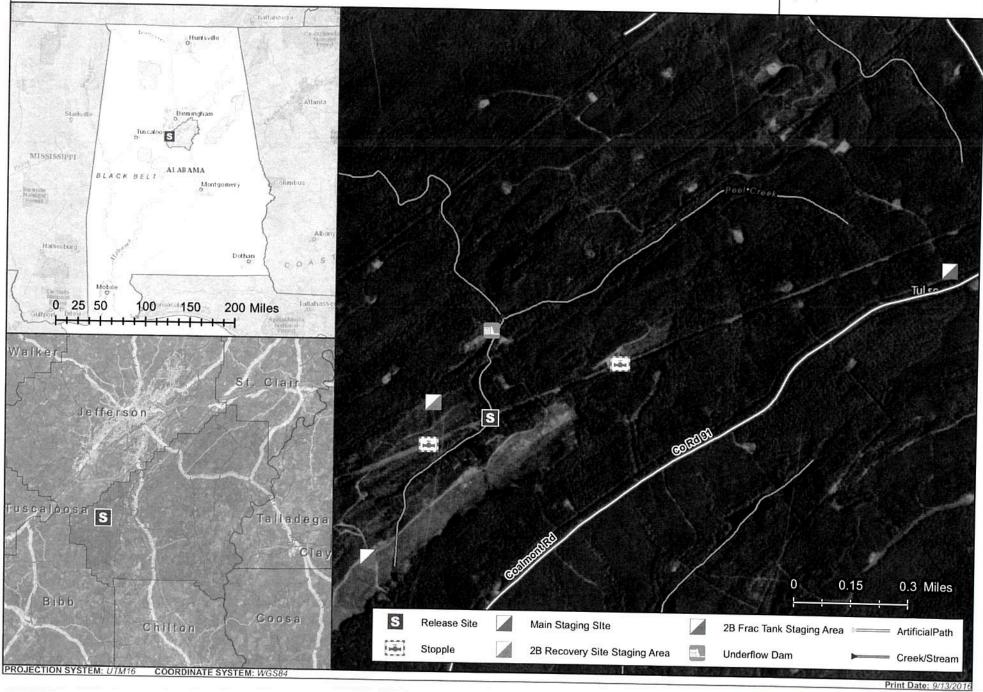
Project: 108465 Client: Colonial Pipeline Location: Shelby County, LA







Project: 108465 Client: Colonial Pipeline Location: Shelby County, AL

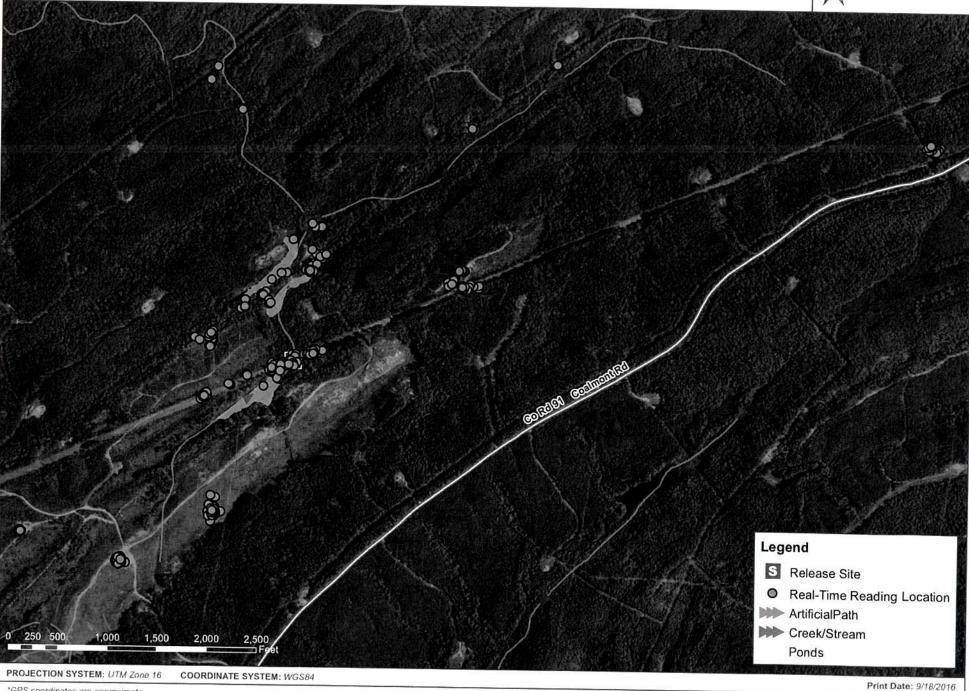




Manually-Logged Real-Time Reading Locations

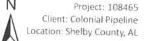
CR-91 Event | 09/18/2016 05:00 - 09/18/2016 17:00

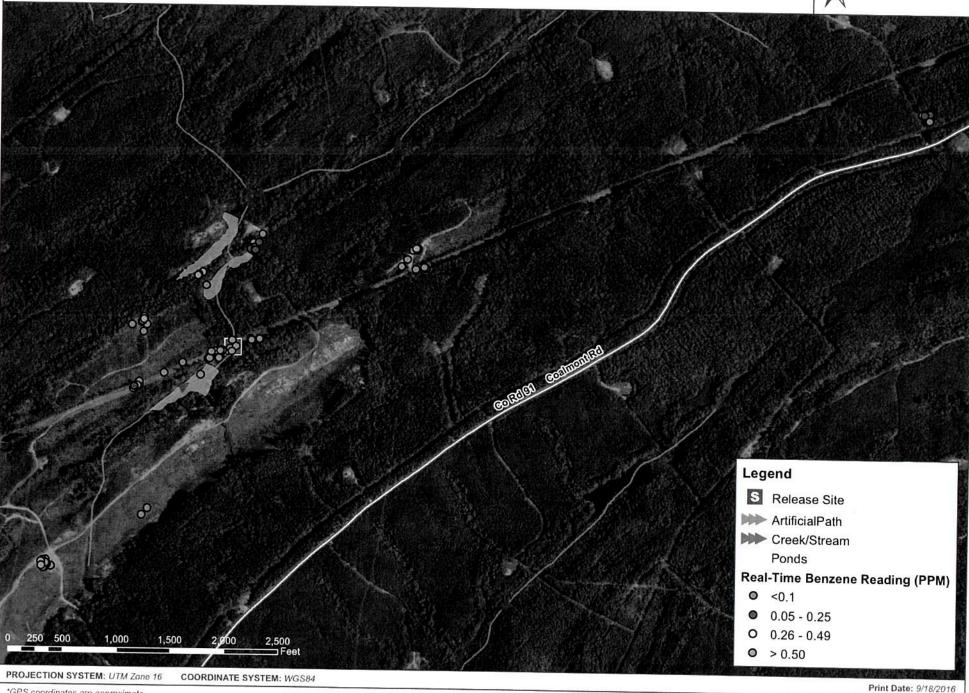




Manually-Logged Real-Time Readings | Benzene

CR-91 Event | 09/18/2016 05:00 - 09/18/2016 17:00



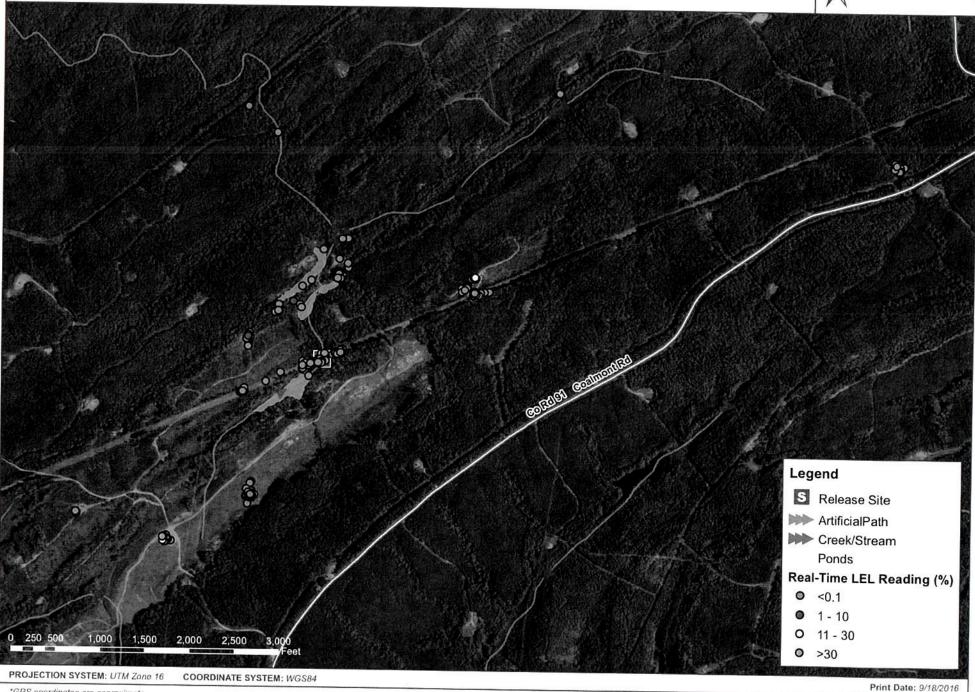


CTEH

Manually-Logged Real-Time Readings | LEL

CR-91 Event | 09/18/2016 05:00 - 09/18/2016 17:00

N Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL

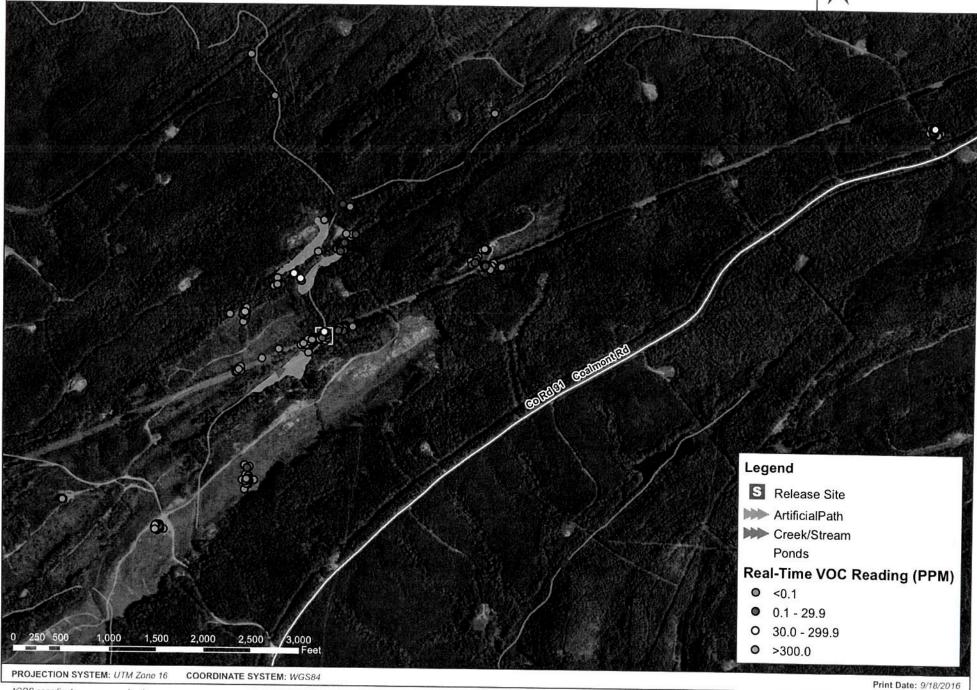


CTEH

Manually-Logged Real-Time Readings | VOC

CR-91 Event | 09/18/2016 05:00 - 09/18/2016 17:00







Appendix II:

Remote Telemetering Air Monitoring Graphs

Remote Telemetering Real-time Air Monitoring | VOC CR-91 Event | 9/18/2016 05, 00 to 9/18/2016 16.59 Unit /tocation

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Date / Time

Remote Telemetering Real-time Air Monitoring | LEL CR-91 Event | 9/18/2016 05:0010 9/18/2016 16:59

Unit/Location

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CR-91 Event – Shelby County, AL Preliminary Air Monitoring Summary September 19, 2016 05:00

Prepared by

Center for Toxicology and Environmental Health, L.L.C. (CTEH®)

On Behalf of Colonial Pipeline





Introduction

On September 9, 2016, the Center for Toxicology and Environmental Health, L.L.C. (CTEH®) initiated air monitoring in support of response efforts to the gasoline release in Shelby County, AL. This report presents the real-time air monitoring data recorded from September 18 2016 17:00 to September 19, 2016 05:00 CDT.

Real-Time Air Monitoring¹

Real-time air monitoring was conducted to evaluate the potential airborne presence of gasoline-associated constituents, if any, during response operations. All instrumentation was calibrated at least once per day or per manufacturer's recommendations. Target analytes were measured as total volatile organic compounds (VOCs), oxygen, benzene, and flammability as the percent of the lower explosive limit (LEL) using remote telemetering RAESystems* AreaRAEs, hand-held instruments such as RAESystems* MultiRAE Pro/Plus' and UltraRAEs, as well as Gastec* colorimetric detection tubes.

During this monitoring period, four benzene, one LEL and 13 VOC action level exceedances were recorded during worker activity monitoring, including instantaneous VOC and benzene readings which were recorded above the action level. When necessary, workers egressed the area in accordance with the approved sampling and analysis plan.

Table 1, below, presents the results of real-time air monitoring using hand-held instruments. Maps of the incident site location and locations of hand-held real-time air monitoring readings are provided in **Appendix I**.

Real-time air monitoring refers to the use of hand-held instruments that provide near-instantaneous readings of an airborne chemical concentration without the need for laboratory analysis.



Table 1: Hand-Held Real-Time Air Monitoring Summary¹ September 18, 2016 17:00 to September 19, 2016 05:00

Location Category	Analyte	Instrument	Count of Count of Countstrument Readings Dete		Range of Detections ^{2,3}
	Benzene	UltraRAE	76	32	0.05 - 6.6 ppm
	%LEL	MultiRAE Plus	27	0	<1 %
Worker Activity Monitoring		MultiRAE Pro	100 1	7 - 7 %	
ormoring	VOCs	MultiRAE Plus	26	11 0.4 - 12.8 pp	0.4 - 12.8 ppm
		MultiRAE Pro	176	118	0.1 - 440 ppm
	Xylene	Gastec #123	1	0	<1 ppm
	Benzene	UltraRAE	RAE 4 2		6 - 160 ppm
Site Characterization	%LEL	MultiRAE Pro	6	2	4 - 8 %
/D/ann Natural	VOC	MultiRAE Pro	6	6	0.9 - 4999.9 ppm4

Please Note: The data displayed in the above table has not undergone complete QC analysis and is presented in a preliminary format.

During this monitoring period remote telemetering equipment recorded 2235 detections of VOCs above the CTEH established action level of 30 ppm and 3 detections of LEL above the CTEH established action level of 10% (3% as raw values on LEL sensors).

Table 2 (below) summarizes remote telemetering AreaRAE data for this monitoring period. For this reporting period AreaRAE monitoring data may contain drift events². Appendix I and Appendix II include location maps and graphs for remote telemetering data, respectively. ⁴

²Maximum detections preceded by the "<" symbol are considered non-detections below the instrument limit of detection (1.0D) value to the right.

Numbers are the raw values, no correction factors have been applied. ⁴VOC sensor upper detection limit for the MultiRAE Pro is 5000 ppm.

² Drift is defined as any interference in the PID's or electrochemical sensor's ability to accurately report the concentration of a chemical in the atmosphere. Humidity, rapid temperature changes, and compromised batteries are examples of common sources of drift.

Table 2: Remote Telemetering Real-time Air Monitoring Summary^{1,3} September 18, 2016 17:00 to September 19, 2016 05:00

AR01	Range of Detections ²	Count of Detections	Count of Readings	Analyte	Location Description	Unit
AR04 2A Frac Tank Staging	1.1 - 4 %	22	2761	_LEL		
AR04	20.9 - 20.9 %	2761	2761	O ₂	2A Compressors	ARO1
AR04 2A Frac Tank Staging	0.1 - 302.1 ppm	2672	2761	VOC		- 5.5
AR05 2A Recovery	<1 %	0	2761	LEL		
AR05	20.9 - 21.3 %	2761	2761	O ₂	2A Frac Tank Staging	ARO4
AR05	0.1 - 70.9 ppm	2581	2761	VOC	選	
AR06 East of Release Site/Near Stopple 2	<1 %	0	2743	LEL		
AR06 East of Release Site/Near Stopple 2	20.9 - 20.9 %	2743	2743	O ₂	2A Recovery	ARO5
AR06	0.1 - 63.7 ppm	2681	2743	VOC		
AR06 Site/Near Stopple 2	<1 %	0	2814	LEL	Fact of Dalace	
AR07 2B Recovery	20.9 - 22 %	2814	2814	O ₂	.H.1941THEELEN AND STATISTICS	ARO6
AR07 2B Recovery	0.1 - 87 ppm	2631	2814	VOC	Site/itedi Stoppic 2	
AR10 Main Staging Area Frac Tanks Moc 2 2747 2747 VOC 2747 2024 LEL 2740 12 LEL 2740 12 LEL 2740 1906 VOC 2740 1906 On path between LEL 2784 0 Recovery 2A and Recovery 2B. VOC 2784 2784 Recovery 2B. VOC 2784 2760 AR11 Main Staging Entrance East of TRG checkpoint Main Staging Entrance East of TRG checkpoint AR12 Boom Site #2 TRG Checkpoint 2 - LEL 2503 0 VOC 2726 973 AR13 AR13 AR14 Cab of excavator at Cab of excavator at LEL 2739 0 AR140 Cab of excavator at Cab of excavator at Cab of excavator at AR150 Recovery 2A and 2A Frac Tank Staging Area. LEL 2739 0 AR160 Recovery 2A 2730 27300 27300	<1 %	0	2827	LEL		
AR08 Main Staging Area Frac Tanks C2 2747 0 0 0 0 0 0 0 0 0	20.9 - 20.9 %	2827	2827	O ₂	2B Recovery	AR07
AR08 Main Staging Area Frac Tanks O2 2747 2747	0.1 - 23.4 ppm	2336	2827	VOC		
AR09 Release Site	<1 %	0	2747	LEL		
AR10 Release Site	20.9 - 21.3 %	2747	2747	O ₂	\$44.50 Mg	ARO8
AR09 Release Site	0.1 - 44.2 ppm	2024	2747	VOC	Talks	
VOC 2740 1906	1.2 - 4.9 %	12	2740	LEL		
On path between	20.5 - 20.9 %	2740	2740	O ₂	Release Site	ARO9
AR10 Recovery 2A and Recovery 2B. AR11 Recovery 2B. WOC	0.1 - 107.9 ppm	1906	2740	VOC		
Recovery 2B.	<1 %	0	2784	LEL	On path between	
AR11 Main Staging Entrance East of TRG checkpoint	20.9 - 21.2 %	2784	2784	O ₂	Recovery 2A and	AR10
AR11 Main Staging Entrance East of TRG checkpoint O2 2726 2726 VOC 2726 973 LEL 2503 0 VOC 2503 301 TRG Checkpoint 2 - LEL 2684 0 access to stopple 1, Recovery 2A and 2A Frac Tank Staging Area. Cab of excavator at O2 2726 2726 VOC 2726 973 LEL 2503 0 VOC 2503 301 VOC 2684 1114	0.1 - 99.9 ppm	2760	2784	VOC	Recovery 2B.	
AR11 East of TRG checkpoint	<1 %	0	2726	LEL	N	
AR12 Boom Site #2 LEL 2503 0 TRG Checkpoint 2 - LEL 2684 0 access to stopple 1, Recovery 2A and 2A Frac Tank Staging Area. Cab of excavator at	20.9 - 20.9 %	2726	2726	O ₂		AR11
AR12 Boom Site #2 VOC 2503 301 TRG Checkpoint 2 - LEL 2684 0 access to stopple 1, Recovery 2A and 2A Frac Tank Staging Area. VOC 2684 1114 Cab of excavator at Cab o	0.1 - 18.4 ppm	973	2726	VOC	east of The checkpoint	
AR13 TRG Checkpoint 2 -	<1 %	0	2503	LEL	Room Site #2	ΔR12
AR13 access to stopple 1, Recovery 2A and 2A Frac Tank Staging Area. Cab of excavator at	0.1 - 1.5 ppm	301	2503	VOC	BOOM Site #2	MNIZ
Recovery 2A and 2A Frac Tank Staging Area. VOC 2684 1114 Cab of excavator at Cab of e	<1 %	0	2684	LEL	a an over a construction of the configuration of th	
Frac Tank Staging Area. VOC 2684 1114 LEL 2739 0 Cab of excavator at 02 2730 2730	20.9 - 20.9 %	2684	2684	O ₂		AR13
Cab of excavator at Cab of	0.1 - 13.1 ppm	A CONTRACTOR OF THE CONTRACTOR	2684	VOC		
AR14 Cab of excavator at O- 3770						
rolongo sito	<1 %	04/20/2000 DA				AR14
VOC 2739 2607	20.9 - 20.9 % 0.1 - 55.5 ppm			CONTRACTOR OF THE PROPERTY OF	release site	

 $^{^1}Please$ note: The data displayed here has not undergone complete QA/QC analysis and is presented in a preliminary formal.

²Maximum detections preceded by the "<" symbol are considered at the limit of detection (LoD) value to the right.

³LEL and VOC values are raw values, correction factors have not been applied.



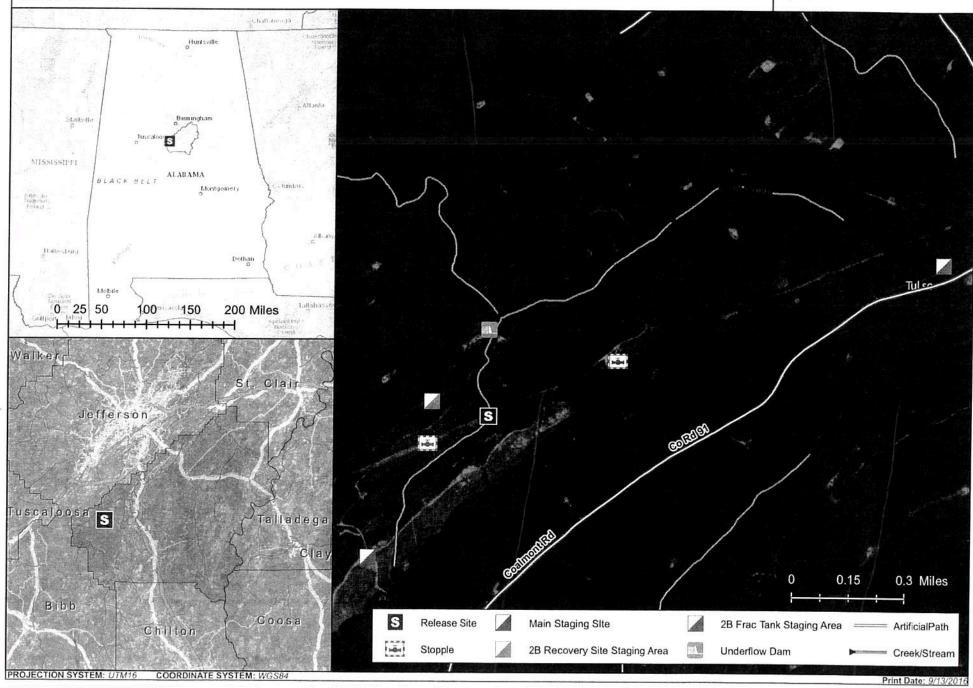
Appendix I:

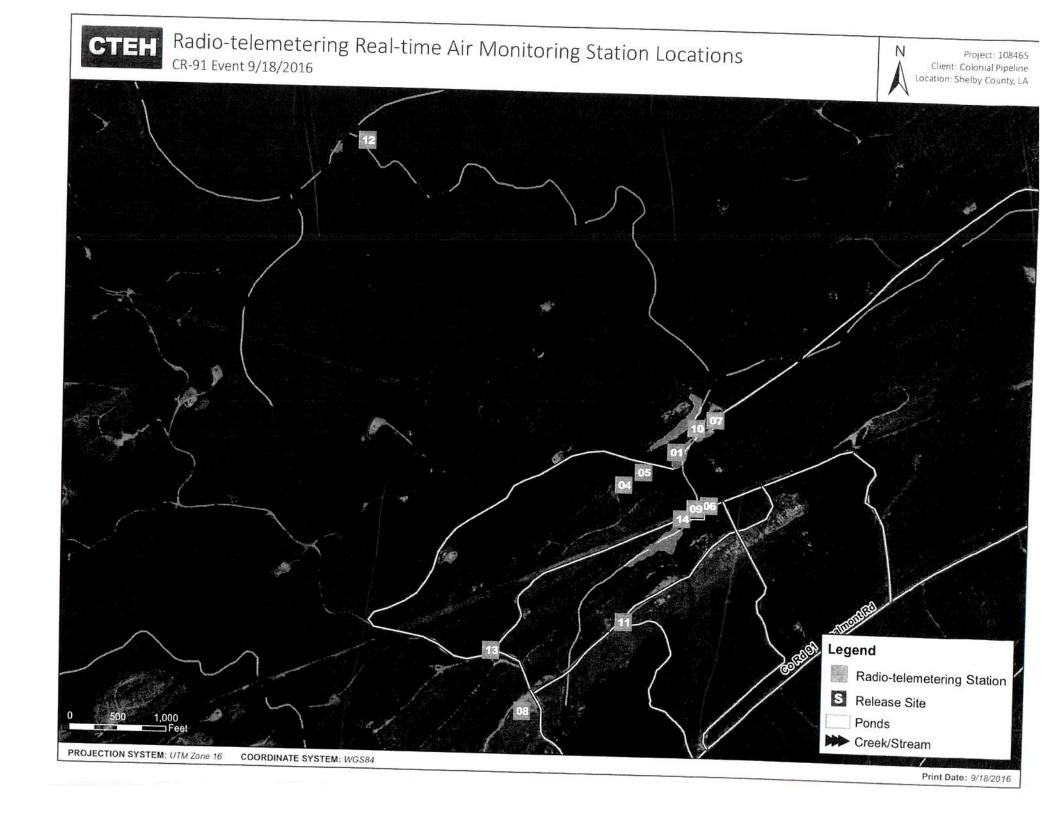
Site Location, Hand-Held Real-Time
Air Monitoring Location, and
Remote Telemetering Air Monitoring
Location Maps





Project: 108465 Client: Colonial Pipeline Location: Shelby County, AL

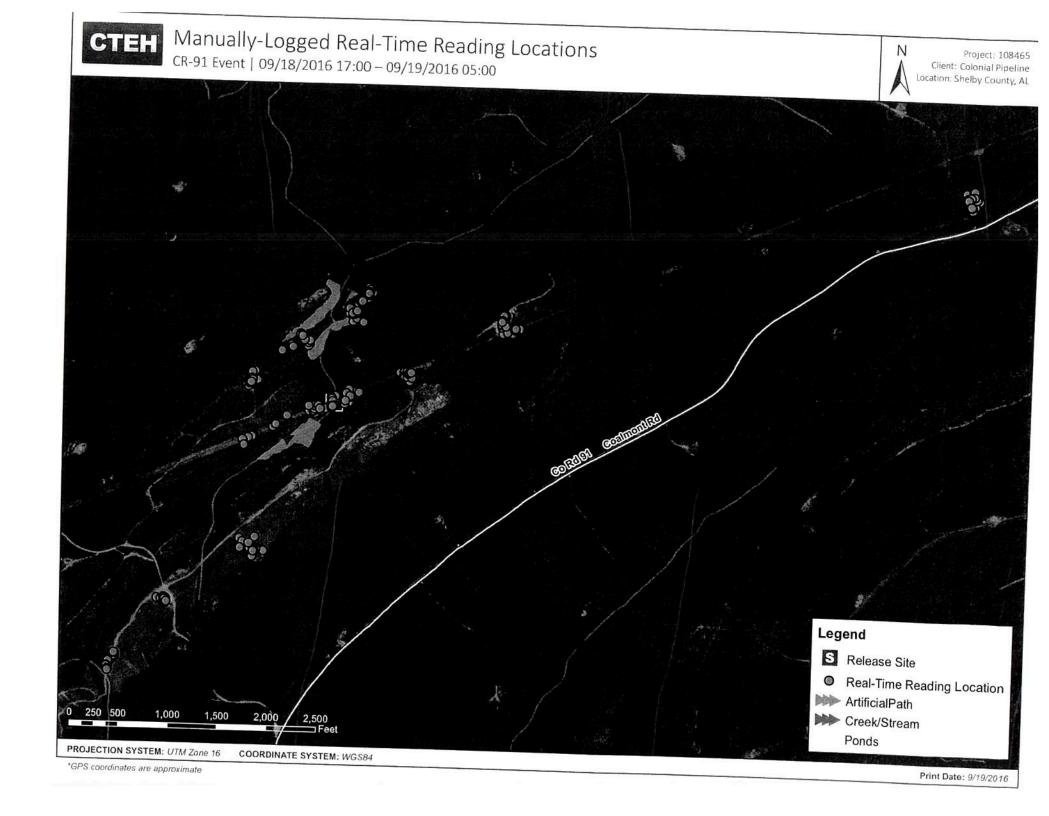






Appendix II:

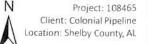
Remote Telemetering Air Monitoring Graphs

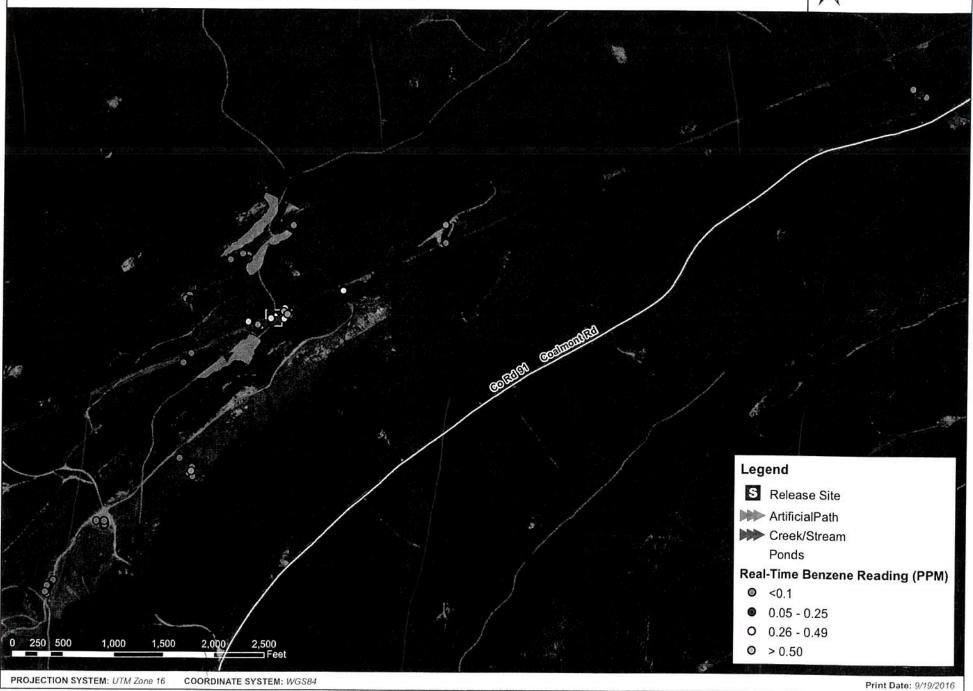




Manually-Logged Real-Time Readings | Benzene

CR-91 Event | 09/18/2016 17:00 - 09/19/2016 05:00





Manually-Logged Real-Time Readings | LEL Project: 108465 CR-91 Event | 09/18/2016 17:00 - 09/19/2016 05:00 Client: Colonial Pipeline Location: Shelby County, AL Legend Release Site ArtificialPath Creek/Stream Ponds Real-Time LEL Reading (%) **o** <0.1 1 - 10 1,000 0 11 - 30

PROJECTION SYSTEM: UTM Zone 16

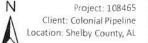
COORDINATE SYSTEM: WGS84

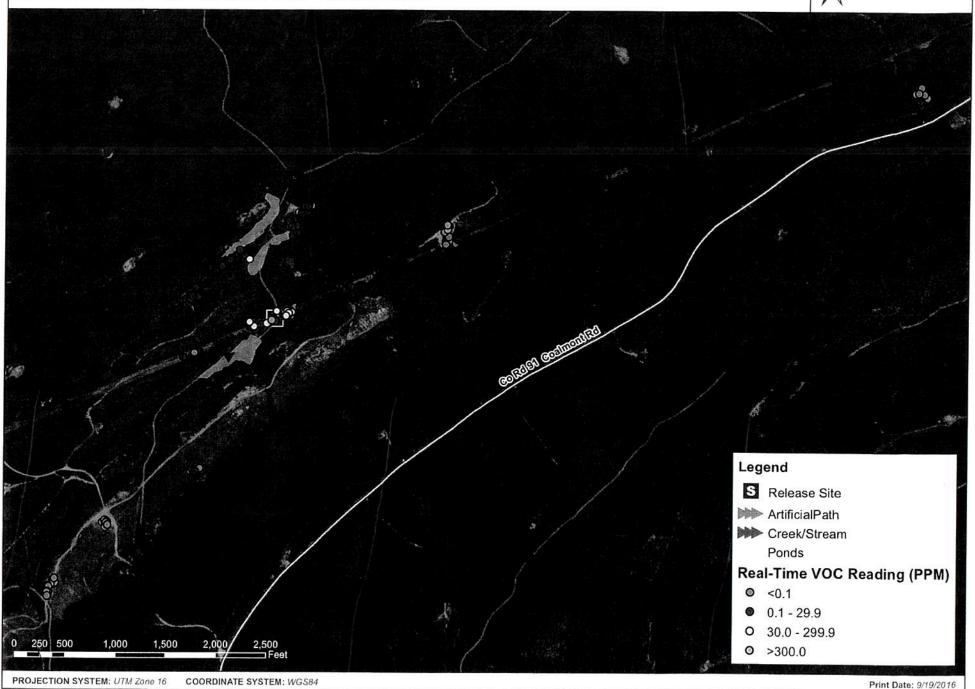
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Manually-Logged Real-Time Readings | VOC

CR-91 Event | 09/18/2016 17:00 - 09/19/2016 05:00





CR-91 Event – Shelby County, AL Preliminary Air Monitoring Summary September 20, 2016 05:00

Prepared by

Center for Toxicology and Environmental Health, L.L.C. (CTEH®)

On Behalf of Colonial Pipeline





Introduction

On September 9, 2016, the Center for Toxicology and Environmental Health, L.L.C. (CTEH®) initiated air monitoring in support of response efforts to the gasoline release in Shelby County, AL. This report presents the real-time air monitoring data recorded from September 19 2016 05:00 to September 20, 2016 05:00 CDT.

Real-Time Air Monitoring¹

Real-time air monitoring was conducted to evaluate the potential airborne presence of gasoline-associated constituents, if any, during response operations. All instrumentation was calibrated at least once per day or per manufacturer's recommendations. Target analytes were measured as total volatile organic compounds (VOCs), oxygen, benzene, gasoline, hexane, naphthalene, xylene, and flammability as the percent of the lower explosive limit (LEL) using remote telemetering RAESystems* AreaRAEs, hand-held instruments such as RAESystems* MultiRAE Pro/Plus' and UltraRAEs, as well as Gastec* colorimetric detection tubes.

During this monitoring period, six benzene, two LEL, and 15 VOC detections were recorded above the action level concentration during worker activity monitoring. During those instances when detections were sustained, workers were either wearing respiratory protection, or egressed the area in accordance with the approved sampling and analysis plan.

Table 1, below, presents the results of real-time air monitoring using hand-held instruments. Maps of the incident site location and locations of hand-held real-time air monitoring readings are provided in **Appendix I**.

¹ Real-time air monitoring refers to the use of hand-held instruments that provide near-instantaneous readings of an airborne chemical concentration without the need for laboratory analysis.



Table 1: Hand-Held Real-Time Air Monitoring Summary¹ September 19, 2016 05:00 to September 20, 2016 05:00

Location Category	Analyte	Instrument	Count of Readings	Count of Detections	Range of Detections ^{2,3}
	Benzene	UltraRAE	160	23	0.05 - 4.1 ppm
Worker Activity Monitoring	Gasoline	Gastec #101L	10	0	<5 ppm
	Hexane	Gastec #102L	8	0	<1 ppm
	%LEL	MultiRAE Plus	147	0	<1 %
		MultiRAE Pro	267	2	4 - 9 %
	Naphthalene	Gastec #60	2	0	<0.1 ppm
	Toluene	Gastec #122	8	0	<1 ppm
		Gastec #122L	1	0	<0.5 ppm
	VOCs	MultiRAE Plus	133	16	0.1 - 31.4 ppm
		MultiRAE Pro	306	126	0.02 - 700 ppm
	Xylene	Gastec #123	9	0	<1 ppm

¹Please Note: The data displayed in the above table has not undergone complete QC analysis and is presented in a preliminary format.

In addition to worker activity monitoring, remote telemetering equipment established as an early warning system recorded 14 detections of VOCs above the site-specific action level of 300 ppm and 3 detections of LEL above the LEL action level of 10% (3% as raw values on LEL sensors). **Table 2** (below) summarizes remote telemetering AreaRAE data for this monitoring period, which may contain drift events². **Appendix I** and **Appendix II** include location maps and graphs for remote telemetering data, respectively.

²Maximum detections preceded by the "<" symbol are considered non-detections below the instrument limit of detection (LoD) value to the right.

³Numbers are the raw values, no correction factors have been applied.

² Drift is defined as any interference in the PID's or electrochemical sensor's ability to accurately report the concentration of a chemical in the atmosphere. Humidity, rapid temperature changes, and compromised batteries are examples of common sources of drift.

Table 2: Remote Telemetering Real-time Air Monitoring Summary^{1,3} September 19, 2016 05:00 to September 20, 2016 05:00

Unit	Location Description	Analyte	Count of Readings	Count of Detections	Range of Detections
		LEL	4531	10	1.1 - 3.4 %
ARO1	2A Recovery	O ₂	1836	1836	20.9 - 21.2 %
		VOC	4531	4002	0.1 - 701.2 ppm
		LEL	5179	0	<1 %
ARO4	2A Frac Tank Staging	O ₂	1306	1306	20.9 - 20.9 %
		VOC	5179	2410	0.1 - 45.4 ppm
		LEL	2282	0	<1 %
AR05	2A Compressors	O ₂	1356	1356	20.9 - 20.9 %
		VOC	2282	1627	0.1 - 141.4 ppm
	F+- (D-1	LEL	5325	0	<1 %
ARO6	East of Release Site/Near Stopple 2	O ₂	757	757	20.9 - 21.1 %
	Site/Mear Stopple 2	VOC	5325	3694	0.1 - 189.3 ppm
		LEL	5094	0	<1 %
ARO7	2B Recovery	O ₂	1634	1634	20.9 - 20.9 %
		VOC	5094	3946	0.1 - 88.1 ppm
		LEL	5185	0	<1 %
ARO8	Main Staging Area Frac Tanks	O ₂	867	867	20.9 - 20.9 %
	Tanks	VOC	5185	2063	0.1 - 13.1 ppm
		LEL	3669	0	<1 %
ARO9	Release Site	O ₂	3669	3669	20.4 - 20.9 %
		VOC	3669	2838	0.1 - 402 ppm
	On path between	LEL	4329	0	<1 %
AR10	Recovery 2A and	O ₂	1365	1365	20.9 - 20.9 %
	Recovery 2B.	VOC	4329	2941	0.1 - 100.5 ppm
	Main Charles E.	LEL	5131	0	<1 %
AR11	Main Staging Entrance East of TRG checkpoint	O ₂	1176	1176	20.9 - 20.9 %
	case of the checkpoint	VOC	5131	1503	0.1 - 12.7 ppm
		LEL	5758	0	<1 %
AR12	Boom Site #2	O ₂	2902	2902	20.9 - 21.4 %
	8	VOC	5758	1235	0.1 - 1.8 ppm
	TRG Checkpoint 2 -	LEL	5116	0	<1 %
AR13	access to stopple 1,	O ₂	1250	1250	20.5 - 20.9 %
	Recovery 2A and 2A Frac Tank Staging Area.	VOC	5116	1547	0.1 - 12.2 ppm
		LEL	4801	0	<1 %
AR14	Cab of excavator at	O ₂	844	844	20.9 - 20.9 %
	release site	VOC	4801	2411	0.1 - 31.7 ppm
1Please r	note: The data displaced by the		1 01/00 1	7-1-T	0.1 - 31.7 ppin

¹Please note: The data displayed here has not undergone complete QA/QC analysis and is presented in a preliminary format.

²Maximum detections preceded by the "<" symbol are considered at the limit of detection (LoD) value to the right.

³LEL and VOC values are raw values, correction factors have not been applied.

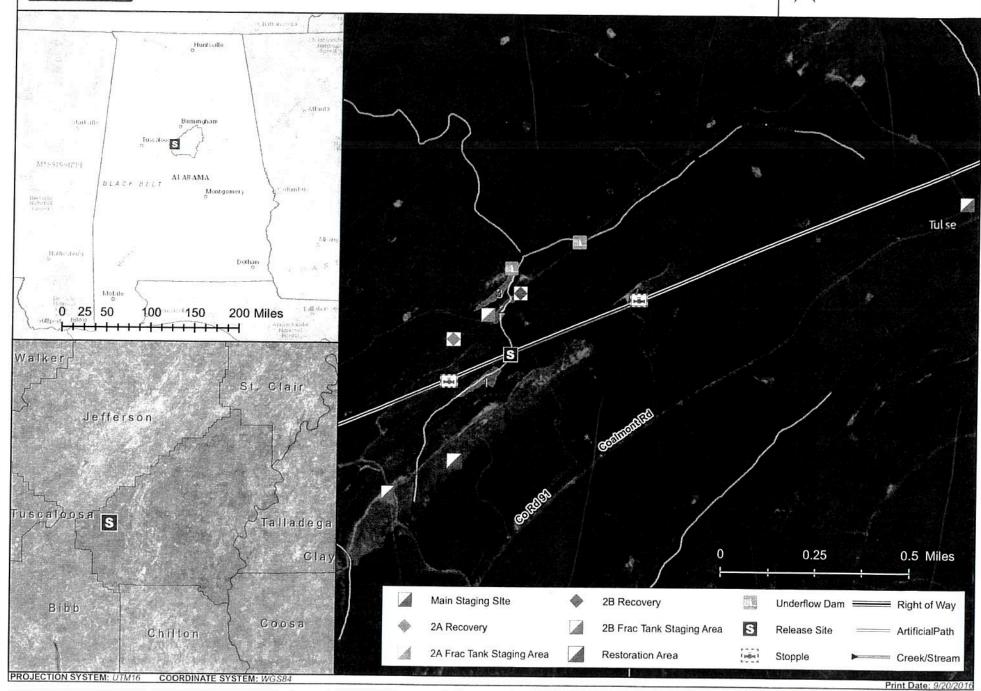


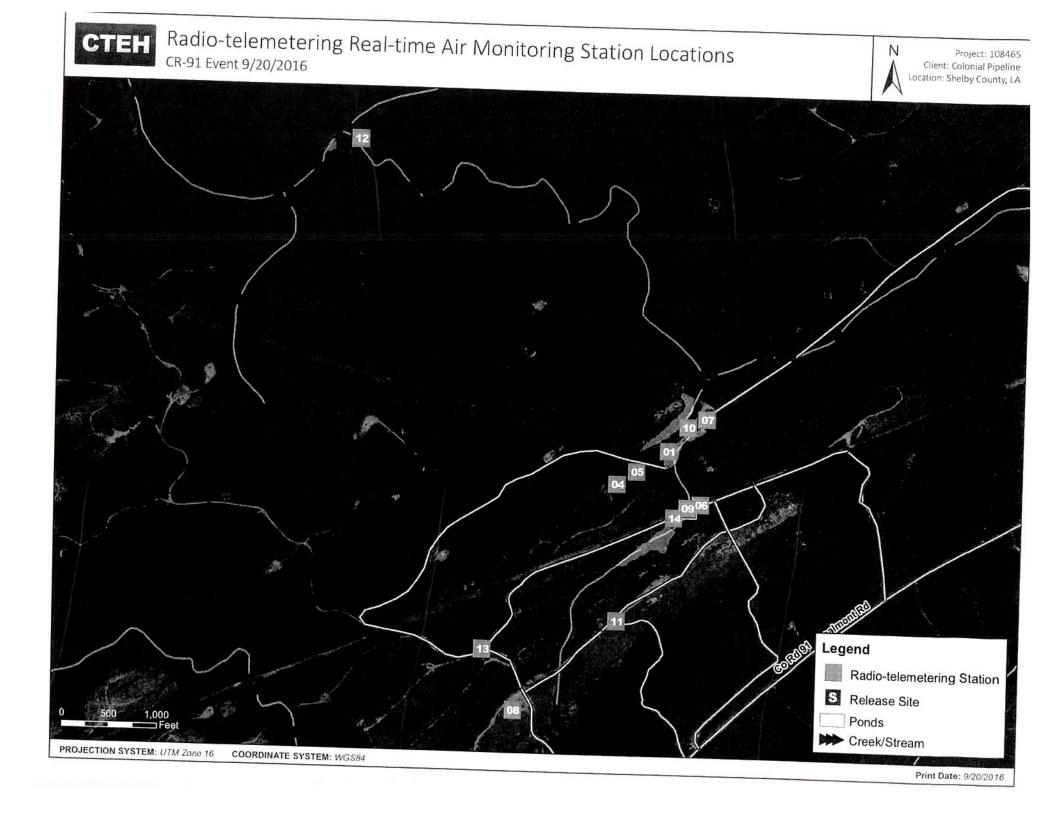
Appendix I:

Site Location, Hand-Held Real-Time
Air Monitoring Location, and
Remote Telemetering Air Monitoring
Location Maps





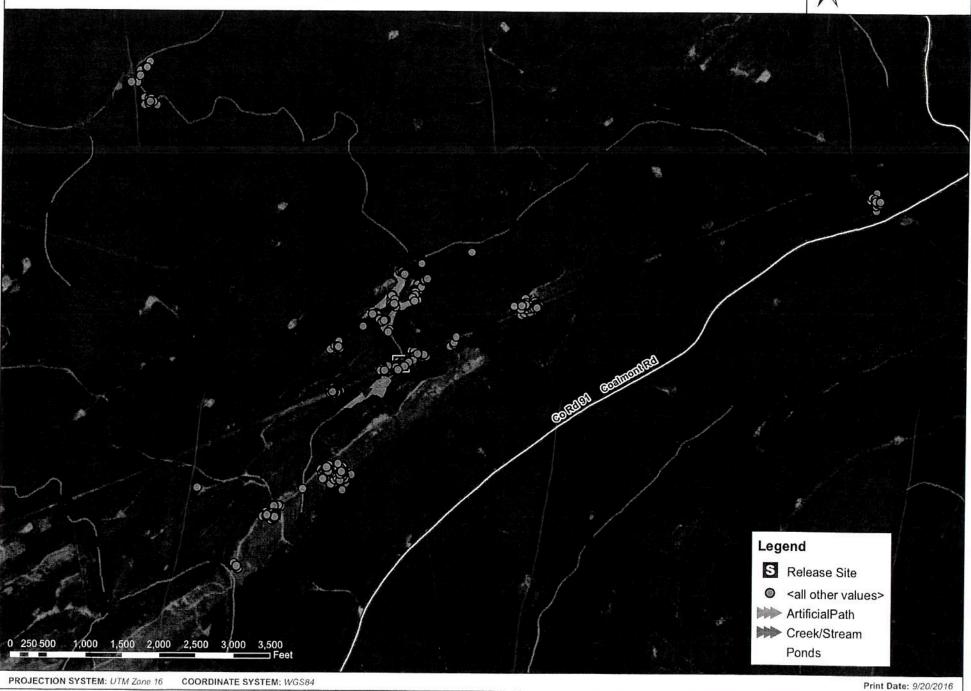






Manually-Logged Real-Time Reading Locations

CR-91 Event | 09/19/2016 05:00 - 09/20/2016 05:00



Manually-Logged Real-Time Readings | Benzene CR-91 Event | 09/19/2016 05:00 - 09/20/2016 05:00

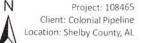
Project: 108465 Client: Colonial Pipeline

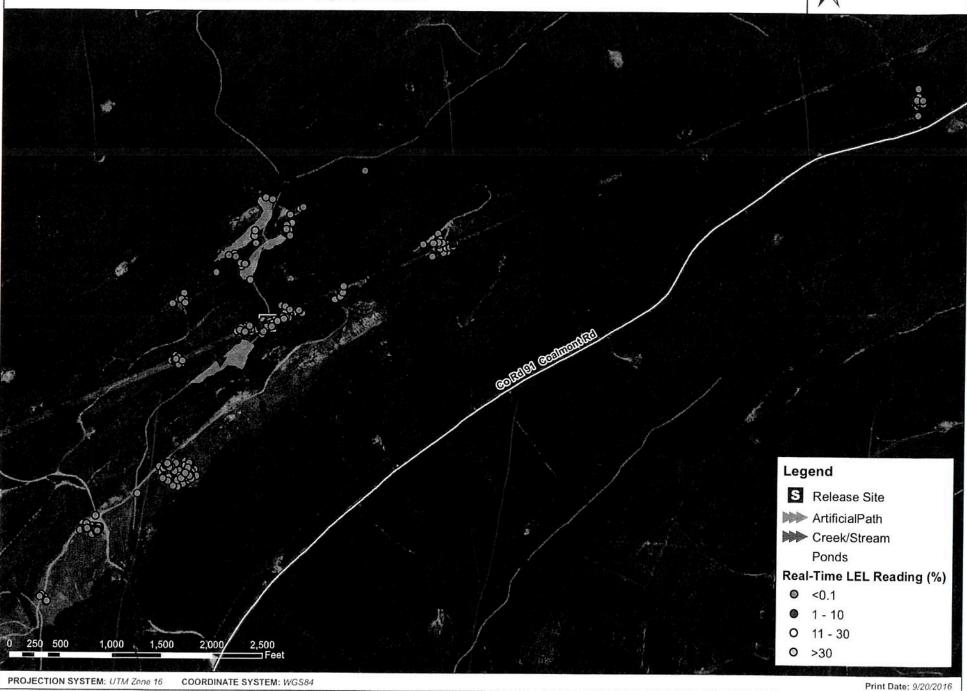




Manually-Logged Real-Time Readings | LEL

CR-91 Event | 09/19/2016 05:00 - 09/20/2016 05:00





CTEH Manually-Logged Real-Time Readings | VOC CR-91 Event | 09/19/2016 05:00 – 09/20/2016 05:00





Appendix II:

Remote Telemetering Air Monitoring Graphs

Remote Telemetering Real-time Air Monitoring | LEL CR-51 Event | 9/19/2016 05:0010/3/20/2015 04:59

Unit / Location

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CR-91 Event – Shelby County, AL Preliminary Air Monitoring Summary September 22, 2016 05:00

Prepared by

Center for Toxicology and Environmental Health, L.L.C. (CTEH®)

On Behalf of Colonial Pipeline





Introduction

On September 9, 2016, the Center for Toxicology and Environmental Health, L.L.C. (CTEH®) initiated air monitoring in support of response efforts to the gasoline release in Shelby County, AL. This report presents the real-time air monitoring data recorded from September 21 2016 05:00 to September 22, 2016 05:00 CDT.

Real-Time Air Monitoring¹

Real-time air monitoring was conducted to evaluate the potential airborne presence of gasoline-associated constituents, if any, during response operations. All instrumentation was calibrated at least once per day or per manufacturer's recommendations. Target analytes were measured as total volatile organic compounds (VOCs), oxygen, benzene, gasoline, hexane, naphthalene, xylene, and flammability as the percent of the lower explosive limit (LEL) using remote telemetering RAESystems* AreaRAEs, hand-held instruments such as RAESystems* MultiRAE Pro/Plus' and UltraRAEs, as well as Gastec* colorimetric detection tubes.

During this monitoring period, eight benzene, one LEL, and 12 VOC detections were recorded above the action level concentration during worker activity monitoring. During those instances when detections were sustained, workers were either wearing respiratory protection, or egressed the area in accordance with the approved sampling and analysis plan.

Table 1, below, presents the results of real-time air monitoring using hand-held instruments. Maps of the incident site location and locations of hand-held real-time air monitoring readings are provided in **Appendix I**.

¹ Real-time air monitoring refers to the use of hand-held instruments that provide near-instantaneous readings of an airborne chemical concentration without the need for laboratory analysis.



Table 1: Hand-Held Real-Time Air Monitoring Summary¹ September 21, 2016 05:00 to September 22, 2016 05:00

Location Category	Analyte	Instrument	Count of Readings	Count of Detections	Range of Detections ²
Worker Activity Monitoring	Benzene	UltraRAE	155	33	0.05 - 4.9 ppm
	Gasoline	Gastec #101L	6	2	10 - 10 ppm
	Hexane	Gastec #102L	6	1	4 ppm
	%LEL	MultiRAE Plus	90	1	8 %
	T	MultiRAE Pro	253	0	<1 %
	Naphthalene	Gastec #60	1	0	<0.1 ppm
	Toluene	Gastec #122	3	2	5 - 5 ppm
		Gastec #122L	4	0	<0.5 ppm
	VOC	MultiRAE Plus	78	16	0.3 - 95 ppm
		MultiRAE Pro	281	130	0.1 - 500 ppm
	Xylene	Gastec #123	6	1	3 ppm
Site Characterization	Benzene	UltraRAE	1	1	1 ppm
	%LEL	MultiRAE Pro	5	0	<1 %
	VOCs	MultiRAE Pro	7	7	25.5 - 100.6 ppm
Community	%LEL	MultiRAE Plus	1	0	<1 %
	VOCs	MultiRAE Plus	1	0	<0.1 ppm

¹Please Note: The data displayed in the above table has not undergone complete QC analysis and is presented in a preliminary format.

In addition to worker activity monitoring, remote telemetering equipment established as an early warning system recorded no detections of VOCs above the site-specific action level of 300 ppm and 78 detections of LEL above the action level of 10% (3% as raw values on LEL sensors). **Table 2** (below) summarizes remote telemetering AreaRAE data for this monitoring period, which may contain drift events². **Appendix I** and **Appendix II** include location maps and graphs for remote telemetering data, respectively.

²Maximum detections preceded by the "<" symbol are considered non-detections below the instrument limit of detection (LoD) value to the right.

³Numbers are the raw values, no correction factors have been applied.

² Drift is defined as any interference in the PID's or electrochemical sensor's ability to accurately report the concentration of a chemical in the atmosphere. Humidity, rapid temperature changes, and compromised batteries are examples of common sources of drift.



Table 2: Remote Telemetering Real-time Air Monitoring Summary^{1,3} September 21, 2016 05:00 to September 22, 2016 05:00

Unit	Location Description	Analyte	Count of Readings	Count of Detections	Range of Detections
ARO1	2A Recovery	%LEL	4350	161	3 - 4.5 %
, ,,,,,	ZATICCOVERY	VOC	4350	1638	0.1 - 129.2 ppm
ARO4	2A Frac Tank Staging	%LEL	5334	0	<1 %
ANOT	ZA Frac Tank Staging	VOC	5334	2202	0.1 - 14.7 ppm
AR05	24 Compressors	%LEL	5396	0	<1 %
ANOS	2A Compressors	VOC	5396	915	0.1 - 30.4 ppm
AR06	East of Release Site/Near	%LEL	5446	0	<1 %
AROO	Stopple 2	VOC	5446	2185	0.1 - 158.4 ppm
ARO7	2B Recovery	%LEL	5019	0	<1 %
ANU7	26 Recovery	VOC	5019	3218	0.1 - 28.4 ppm
ARO8	Main Charles Associated	%LEL	5449	0	<1 %
ANUO	Main Staging Area Frac Tanks	VOC	5449	1319	0.1 - 15.2 ppm
		%LEL	5454	2	2.5 - 2.9 %
AR09	Release Site	O ₂	5454	5454	20.4 - 21.5 %
		VOC	5454	4224	0.1 - 283.6 ppm
AR10	On path between Recovery 2A	%LEL	5257	0	<1 %
ANIO	and Recovery 2B.	VOC	5257	2948	0.1 - 100.8 ppm
AR11	Main Staging Entrance East of	%LEL	4278	0	<1 %
WILL	TRG checkpoint	VOC	4278	1772	0.1 - 9.5 ppm
AR12	Boom Site #2	%LEL	5559	0	<1 %
ANIZ	BOOM Site #2	VOC	5559	2147	0.1 - 1.9 ppm
AR13	TRG Checkpoint 2 - access to stopple 1, Recovery 2A and 2A	%LEL	5314	0	<1 %
	Frac Tank Staging Area.	VOC	5314	1882	0.1 - 5.8 ppm
AR14	Cab of excavator at release	%LEL	5287	0	<1 %
	site	VOC	5287	2433	0.1 - 34.4 ppm

¹Please note: The data displayed here has not undergone complete QA/QC analysis and is presented in a preliminary format.

²Maximum detections preceded by the "<" symbol are considered at the limit of detection (LoD) value to the right.

³LEL and VOC values are raw values, correction factors have not been applied.

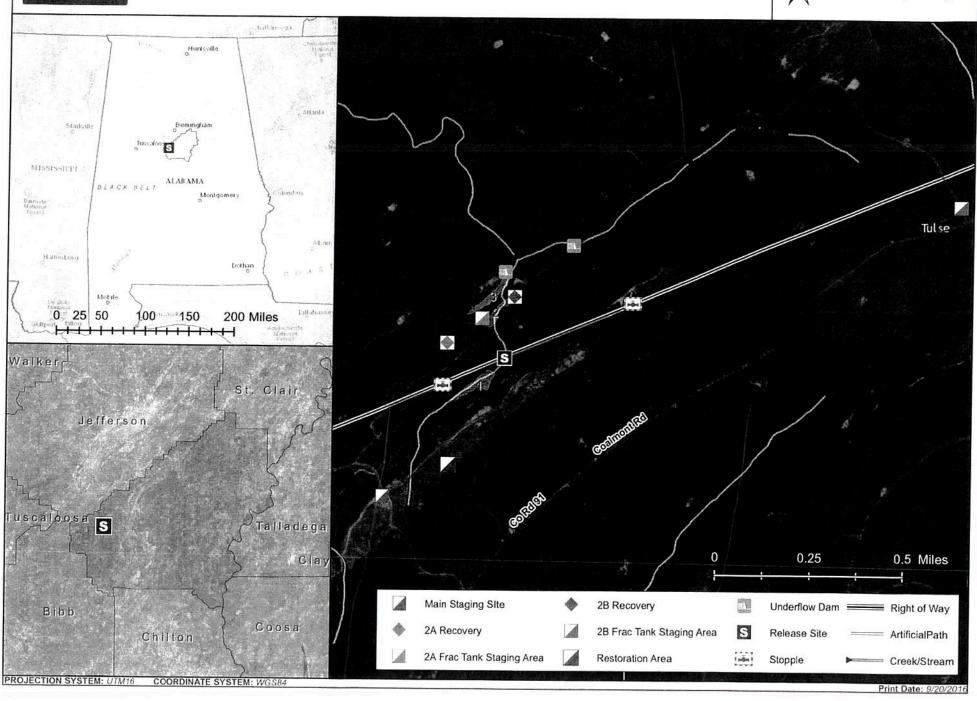


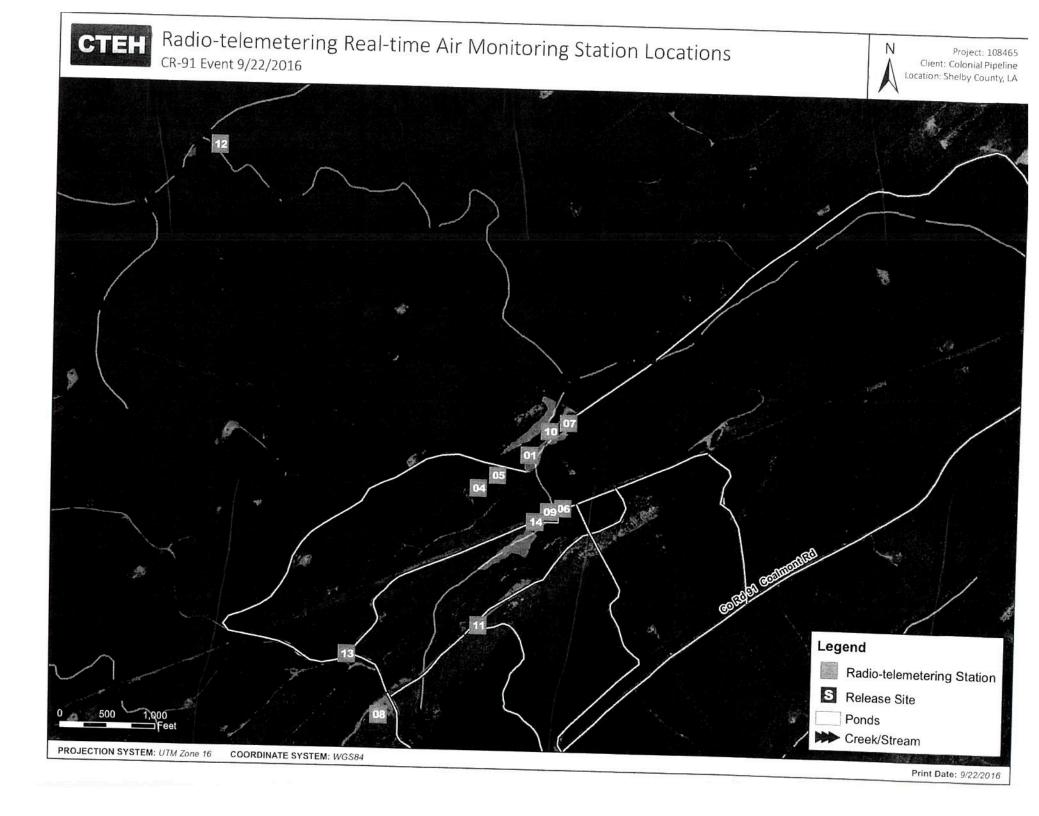
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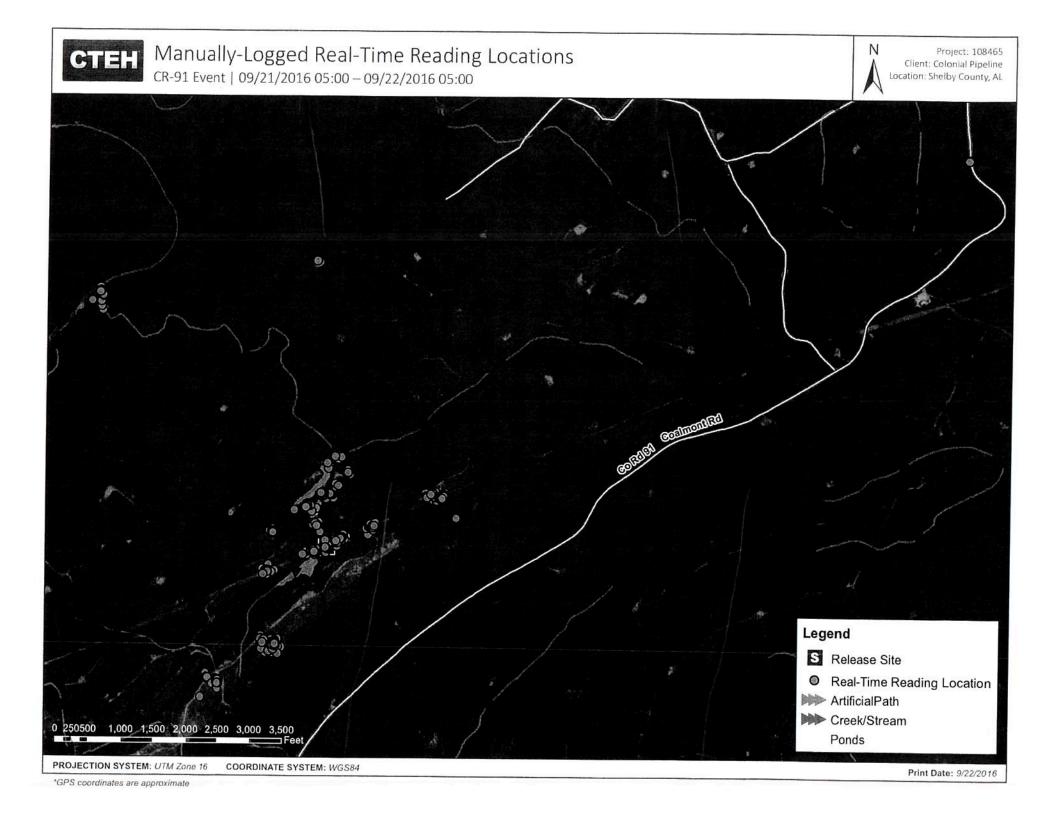
Site Location, Hand-Held Real-Time
Air Monitoring Location, and
Remote Telemetering Air Monitoring
Location Maps











Manually-Logged Real-Time Readings | Benzene

CR-91 Event | 09/21/2016 05:00 - 09/22/2016 05:00

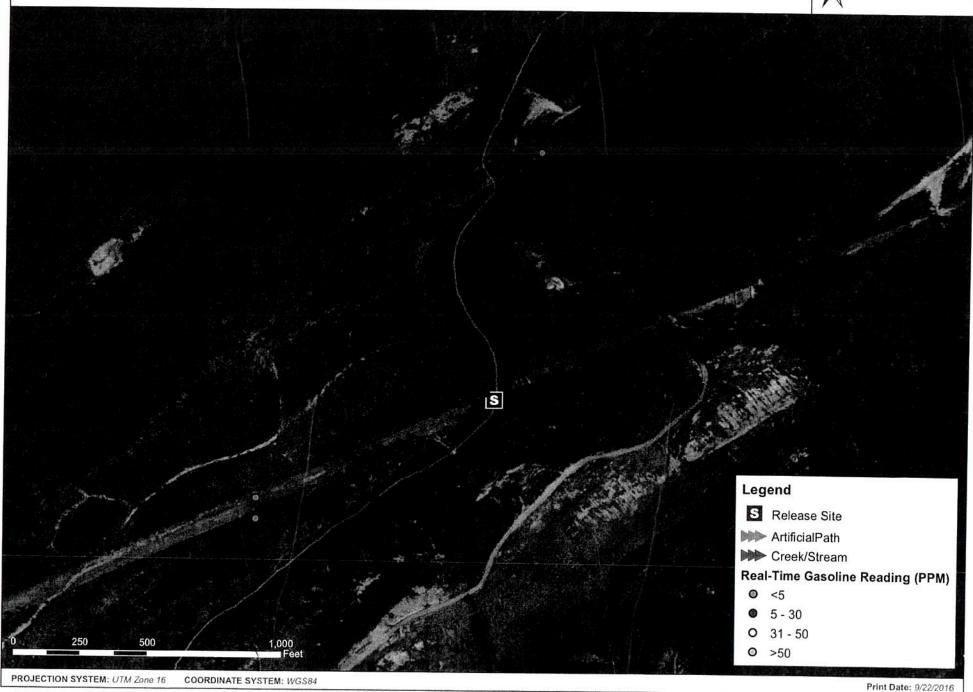






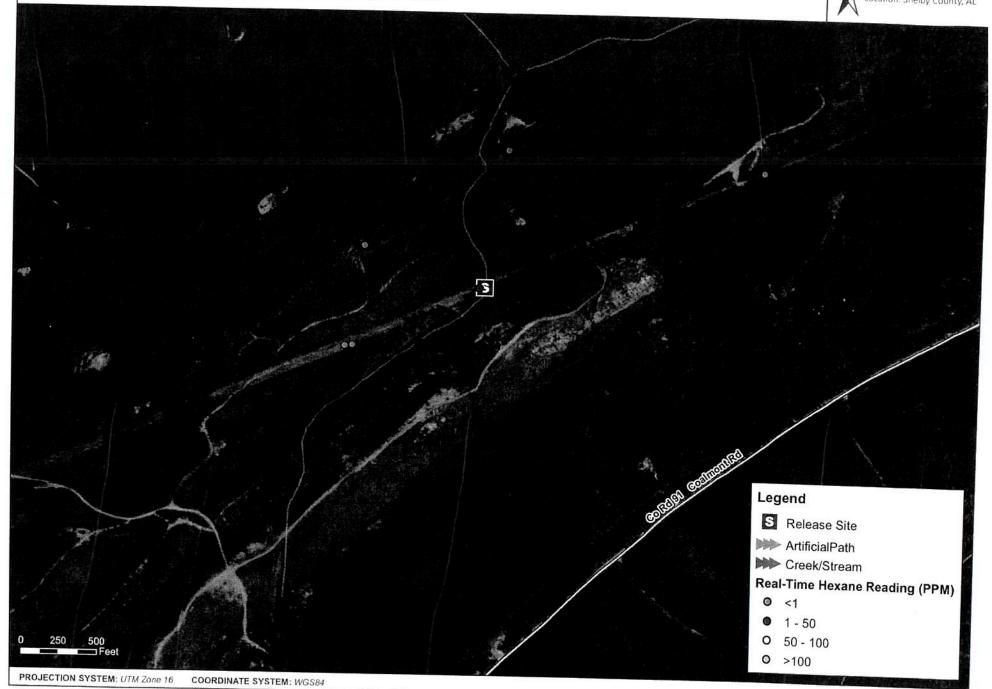
Manually-Logged Real-Time Readings | Gasoline

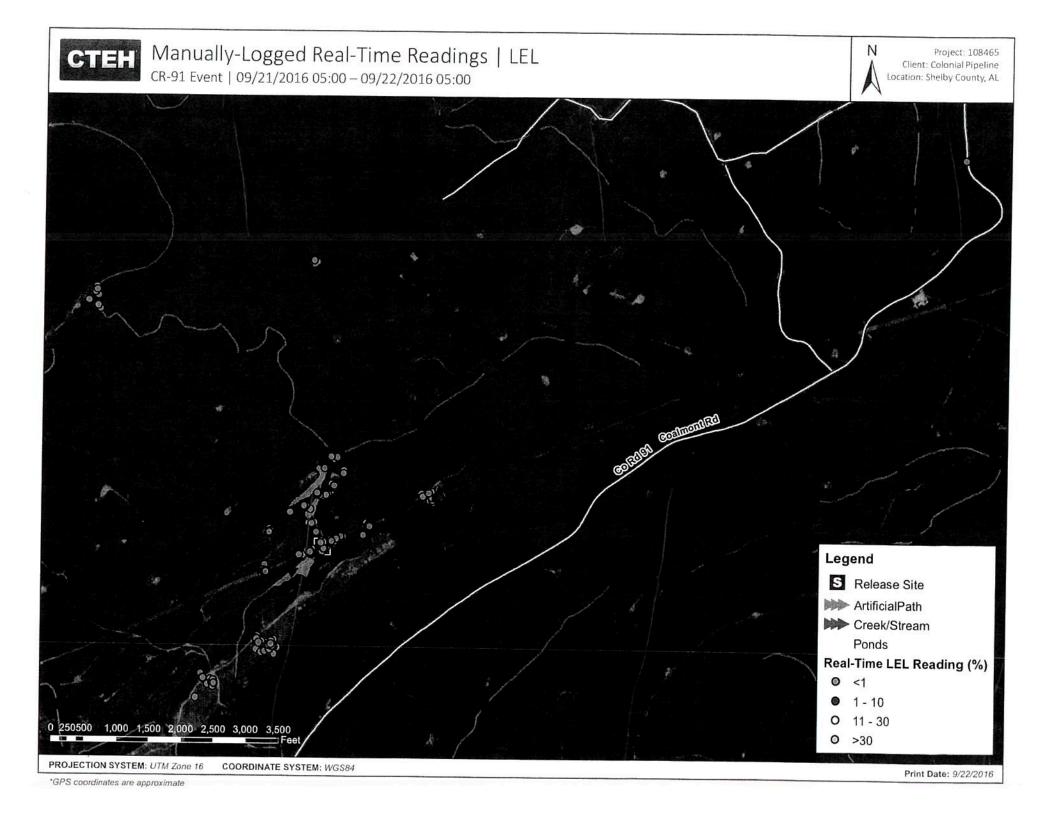
CR-91 Event | 09/21/2016 05:00 - 09/22/2016 05:00





CTEH Manually-Logged Real-Time Readings | Hexane CR-91 Event | 09/21/2016 05:00 - 09/22/2016 05:00





Remote Telemetering Real-time Air Monitoring | VOC CP-91 Event | 9/21/2015 GS 0010-9/22/2015 041 S9

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Remote Telemetering Real-time Air Monitoring | Oxygen CR-91 Event | 9/21/2016 05:00 to 9/22/2016 04:59

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				Date / Time			

Remote Telemetering Real-time Air Monitoring | LEL OR-91 Event | 9/21/2016/05/0010 9/22/2016/04/59

Unit / Location

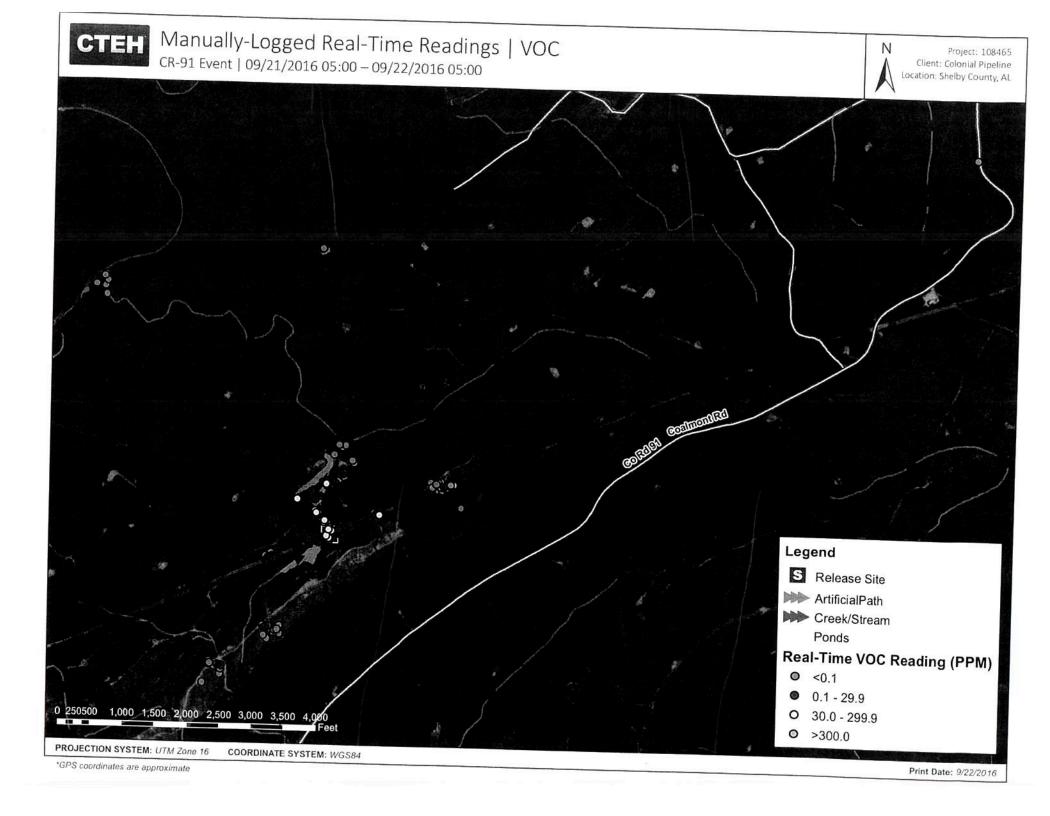
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Appendix II:

Remote Telemetering Air Monitoring Graphs





Manually-Logged Real-Time Readings | Toluene

CR-91 Event | 09/21/2016 05:00 - 09/22/2016 05:00



